

AMERICAN BLACKSMITH

A Practical Journal of Blacksmithing and Wagonmaking

BUFFALO
N.Y. U.S.A.

OCTOBER, 1912

\$1.00 A YEAR
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FREE BENEFITS FOR HORSESHOERS and THEIR FAMILIES

You Should Know All About The Ring-Point Benefit Fund

The fund will be made up by the deposit by The Rowe Calk Company in the hands of three Trustees, of two and one-half cents for each Ring-Point box label sent to the Trustees by a horseshoer to help the fund.

Until the fund becomes large, payments will be made only to those sending labels to the Trustees before Claim arises.

Funds contributed for labels sent in from any State will be paid out only in that State, except in unusual cases.

Payments to Horseshoers and Their Families.

1. To any needy horseshoer, qualified as above stated, who is incapacitated by sickness or accident, the sum of \$5.00 a week, while so incapacitated, for not more than five weeks, upon the statement of a practicing physician.

2. To the needy widow or family of a deceased horseshoer, qualified as above stated, not able to bear his funeral expenses, the sum of \$25.00.

3. To the needy widow of a horseshoer, qualified as above stated, not able to support herself, the sum of \$3.00 a week for not over eight weeks following his death, unless more money in the fund is available and in that case for not more than sixteen weeks.

If such needy widow has dependent children less than twelve years old, the extra sum of \$1.00 a week for each such child not exceeding two, for such period.

4. At any time within one year after the death of a horseshoer, qualified as above stated, to the needy widow of such horseshoer, who is incapacitated by sickness or accident, the

sum of \$5.00 a week while so incapacitated, for not more than five weeks, upon the statement of a practicing physician.

Such payments provided for in this section shall be in place of those specified in section three if such incapacity occurs while the payments specified in section three are being made.

5. At any time within one year after the death of a horseshoer, qualified as above stated, to the needy widow of such a horseshoer, who has a dependent child or children less than twelve years old that are under the care of a practicing physician, the amount of the doctor's bill not to exceed three dollars a week for any one week's service for a period of not more than five weeks.

6. If a horseshoer, qualified as above stated, dies without a surviving wife, but with one or more children less than twelve years old, and such children have no relatives able to support them, the sum of \$1.00 a week will be paid towards their support for not over twenty-five weeks for each one, not exceeding two.



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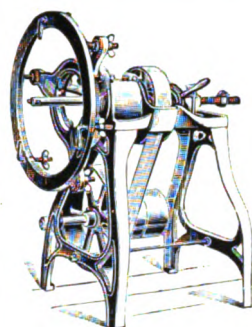


Fig. 708
Hub Boring Machine

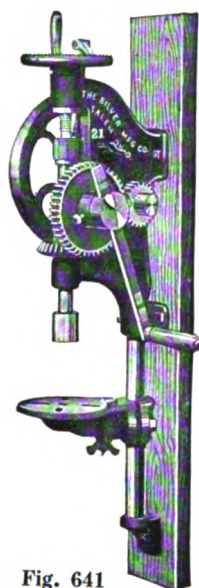


Fig. 641
No. 21 Hand Post Drill



Fig. 642
No. 22 For Hand Power

Graceful Serviceable Tools At Moderate Prices

Do not let your favorable impression end with your admiration for the graceful designs and neat lines of Silver's Tools. They possess in a high degree the ability to turn out high-grade work at minimum cost—to make money month after month for you. Wherever good honest construction at a low price appeals, Silver's tools are favorites. Adapted for auto garage work and repairing. Insist on the "Silver" kind—don't take any other—then you'll have no cause for regret.

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- HUB BORING AND SPOKE TENONING MACHINES**—Illustrating and describing several sizes of each.
- BAND SAWS, JOINTERS AND SAW TABLES**—Special loose leaves, illustrating and describing 20" Band Saws for foot or belt power or combination; 26, 32 and 36" power Band Saws with new features; also Saw Tables and five sizes of Jointers.

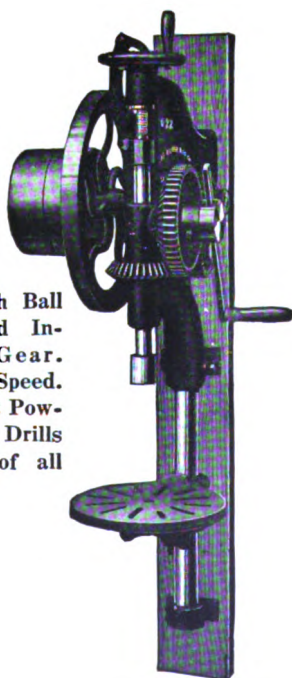


Fig. 644. No. 22.

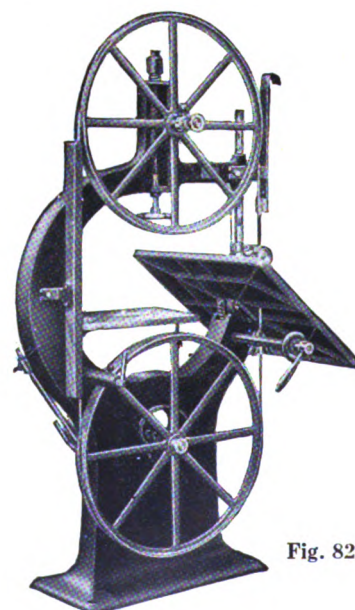


Fig. 822
Band Saw - Four Sizes

Made with Ball Bearings and Intermediate Gear. Fast or Slow Speed. Hand or Belt Power. Perfect Drills for work of all kinds.

TIMELY TALKS WITH OUR SUBSCRIBERS



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Our 1913 Calendar

Watch for our calendar for 1913. It is certainly a beautiful work of art. And we will again be able to supply some of these beautiful date-keepers for advertising your own shop. We will print your business card of ten words or less on any quantity of these handsome calendars, and as they will contain no other advertising matter they will be your calendars, and can be handed out as such to your customers. The price will be so low that it will surprise you.

And to those of our readers whose account is paid up to and including January, 1913, we are going to send one of these beautiful art reproductions free of charge. If you want a calendar, better pay up your subscription account and get into line. Tell your neighbor.

Profit from the Advertisements

You readers who have been reading THE AMERICAN BLACKSMITH since the beginning—you folks who have been receiving "Our Journal" for the past ten years—have you noticed the changes, the improvements made in the advertisements in the past ten years? Have you noticed how much more information you get out of an advertisement now than you did years ago? The advertiser no longer says "Bleezer's Blowers are the Best." Do you know why? The advertiser knows that such statements are not sufficient—you know you don't take any stock in that talk. The advertiser today has to prove to you that his blower, drill, horseshoes or wheels are just what he says they are. And he does prove his statements—witness, his free trial offers and his money-back guarantees. And today his advertisements say something of interest and value to you. He has put real reasons into his advertising. His ads tell you something—they are worth reading. They are distinctly worth your time to read, to study and to think about. If you want to keep up with the times you've got to read the ads in your trade journals.

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The Twelfth Year

This issue marks the beginning of the twelfth year of THE AMERICAN BLACKSMITH. With this number we start on another mile of our journey—a journey that has, we earnestly believe, been marked with craft betterment, craft uplift and improved conditions generally.

And now upon the eve of the twelfth year we are planning still greater improvements, still bigger things, still better features.

First and foremost we are planning to give the smith more information on business and business methods. True, we have been paying a great deal of attention to costs, profits, losses and selling prices, but we are going to give you more of that same matter. We thoroughly believe that if a smith knows what his costs are he is not very likely to be a price-cutter. When he knows what it costs him to do business he is more likely to insist upon getting the right price for his work.

So, beside keeping you posted on new machines, methods, hints and kinks, we are going to tell you what you should know about your business, why you should know it, and then how you can know what you should know.

The series of articles by Mr. Burroughs is right along this line. You'll find lots of hints and suggestions in his papers. The examples of actual business incidents make his series especially interesting, and while he will probably refer to few smithshops in his illustrations, all of the ideas can be applied to a greater or lesser degree to a smithshop business.

And along the same line are the talks planned by the Editor and which will appear under "Around Our Forge Fire." These talks are based upon the Editor's address before the Northwestern Pennsylvania Association at their last annual picnic. There are six talks in the first series. Each will be complete in itself, but all of them will bear an intimate relationship to profits, costs, selling prices and better business knowledge. Other writers on business subjects will be made known as the seasons for their writings open.

On mechanical subjects, there will be Mr. Cran, Mr. Hillyer and Mr. Sallows; Mr. Weaver and E. W. P. on horseshoeing and anatomy; J. L. H. on vehicle-building and repairing; and our old friend Thornton, who is now at work on an entirely new series, will "start his fire" some time along in the winter.

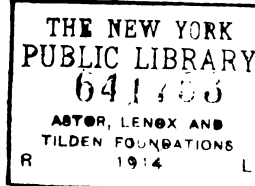


NATURE IN ONE OF HER PRETTIEST DRESSES

The Vehicle Shop

Its Plan, Construction and General Arrangement

F. L. ABBOT



THE arrangement of the vehicle shop should be carefully thought out before a final decision is made. Usually the repair shop is any old building that will prove suitable. This is used as a starting point and, as the business grows, other structures are added at various points until the entire establishment presents a mixed mass of shops of no particular arrangement and without an apparent idea or thought for convenience in handling work.

The keynote to all plans for vehicle shops should be the easy handling of work and the most advantageous handling of supplies in connection with the work.

Several Plans

There are a number of excellent plans in common use today. There are the square building, the T-shaped, L-shaped and the U-shaped buildings, and then the two parallel buildings with a yard and driveway between them.

The square building, except for the small shop, is not the best from the viewpoint of economy of time and space. The T-shaped shop is excellent, especially if horseshoeing is to be done in connection with the other work. One end of the building can be used exclusively for the shoeing department, without disturbing other departments, and still give a direct entrance from the street.

The L-shaped building has about the same advantages, while the U-shaped and the parallel buildings do not greatly differ in their arrangements. Perhaps the determining factor in favor of any of these plans is the lot upon which the shop is to be placed. And the exact position of the building upon the lot

depends upon the size and shape of the latter.

The Office

No matter what plan of building is used, the office should be at the main entrance. And both main entrance and office should be so located as to be within reach of any part of the building quickly and with the least possible number of steps. Of the several designs mentioned, Fig. 1 shows the best location for the office in the average shop. The small black square in each plan represents the office; while the short heavy lines represent the entrances and the side with the double line represents the street side of the building.

The Entrances

The entrances for vehicles should be large enough to admit the largest truck or vehicle of any kind without difficulty. It is far easier to build the entrance too large than to tear out a part of it after it is built to

admit a large wagon or truck, because the entrance is too small. Then there are also the doorways communicating with the various departments. These should also be of ample size. There should be no need for removing the wheels from the vehicle when once in the shop, except for repairing or painting. The doorways and aisles and the passages between and around machines, forges and equipment should be wide enough to allow the vehicle to be run from one part of the establishment to another easily and quickly.

The ceilings of the shop should be high enough to allow any vehicle to pass without unhooking. It must be borne in mind that every unnecessary bit of work done on a vehicle adds to the cost of doing the whole job. And when, on account of narrow doorways or low ceilings, you must take down some part of the job that would otherwise be unnecessary you cannot do the work as cheaply as your competitor who

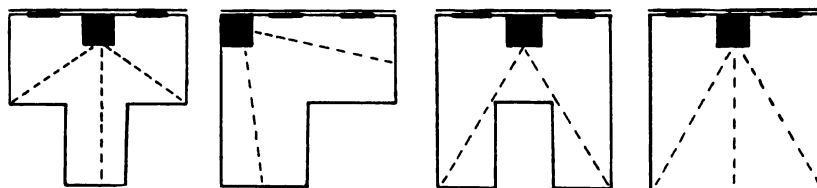


THE VEHICLE SHOP OF MR. N. M. NORTON OF NEW YORK STATE

has a high ceilinged shop with wide doorways.

Elevators and Runways

And what has been said with regard to doors and ceilings applies



HOW THE OFFICES SHOULD BE LOCATED IN VARIOUS SHOP PLANS

also to the elevator or runway leading to the paint, trimmings and other shops above the ground floor. The elevator should have a high crossbeam and a large platform, while if a runway is used it should be of ample width and supported sufficiently strong to carry the heaviest vehicle without danger of accident.

Now, as to the relative advantages of the elevator and the runway—the runway has the advantage of rapidity, though the elevator takes up the least room. The writer has, however, seen several runways that could be put up and taken down very easily and quickly; thus taking up no room when not in use. The engraving, Fig. 2, will give an idea of how a runway of this kind can be arranged. When not in use the runway lies flat on the ground of the shop yard. When put up, supports made for the purpose are placed in position under the incline.

Another convenience in the shop is a shute for conveying small articles from one floor to another. A simple device of this kind will save many a step for the busy men.

Arranging Equipment

The actual arrangement and placing of the machines and equipment will of course depend upon individual ideas, but there are general rules in regard to the placing of machines that should be observed. For example, the woodworking department should adjoin the smithing department. The woodworking department, in the shop where repair work is done, should not be on one floor while the smithing is done on another one. When this is the case there is too much "lost motion" between the two departments.

In the smith shop, the forge should be the center from which all other equipment is placed into

position. Near the forge and its anvil should be a heavy bench, not necessarily large, with a heavy vise. Near by should also be the power hammer, if one is included in the

equipment, the drill press and the punch and shear. And not far away should be the tire and axle shrinker. This seems like a lot of machines to group around a forge, but it is for just that reason that the forge in the vehicle shop should be away from the shop wall and out in the shop. And if business warrants the addition of another forge the same equipment can be used from both forges without a rearrangement of machines.

In the woodworking shop the machines can usually be placed in a row, so that a piece of lumber can be taken though the various stages of rough stock to the finished product without one false step. Some wood shops arrange their machines in a semi-circle around a standpoint from which an operator can put a board through its operations with little or no lost motion.

Again, there are many shops using the combination woodworking machines. These machines take up comparatively little space when the number of machines they combine is considered. And for the average shop which cannot afford separate

individual machines these combinations are excellent. Some of these combined woodworkers are also made portable, so that it is now possible to take the machine to the work no matter where located. This has a tendency to save time and labor and consequently to increase your profit. These machines can be had in almost any combination to suit the individual requirements or tastes of the shopman.

One matter which the writer thinks most appropriate to speak of at this time is the proper safeguarding of the workmen operating the woodworking machines. Simple guards can easily be made right in the shop, and if properly placed they will not lessen the efficiency of the men, but will on the contrary enable the men to do more and better work, because they can devote all their attention to watching their work instead of keeping one eye on the work and the other eye on their fingers.

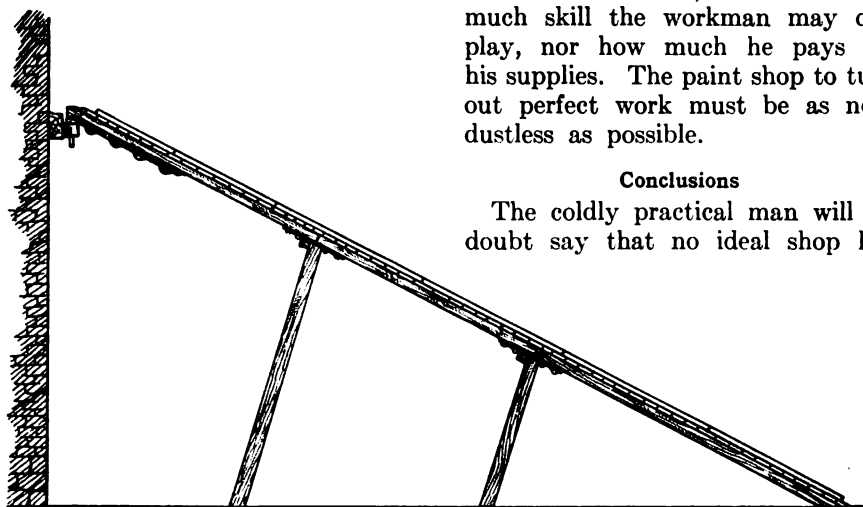
Paint and Trim Shops

The painting and trimming shops are usually on the second floor, though this is by no means necessary if they can be kept on the ground floor. It is necessary, however, with these departments on the ground floor to so arrange the establishment that every vehicle, whether it does or does not require painting and trimming, will not need to be hauled through these departments.

The floors and walls separating the paint shop from other departments must be dust-proof if the best work is to be turned out. If the paint room is located over the forge shop, and the floor is not tight, good work cannot result, no matter how much skill the workman may display, nor how much he pays for his supplies. The paint shop to turn out perfect work must be as near dustless as possible.

Conclusions

The coldly practical man will no doubt say that no ideal shop has

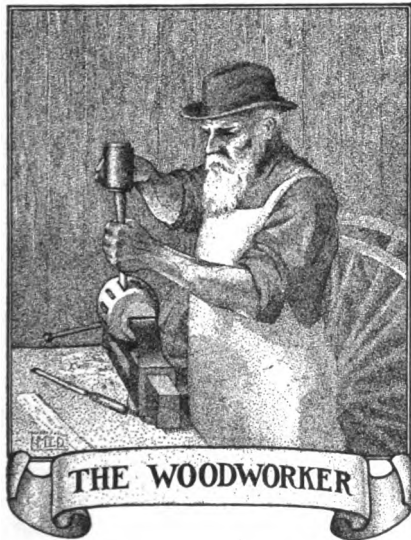


A CONVENIENT RUNWAY THAT MAY BE QUICKLY TAKEN DOWN

been illustrated or described—that an article on shop plans and the arrangement of equipment is incomplete without examples of good equipment. In these days of intensive management and the seeking of extreme efficiency it is not “what is the other fellow doing?” but “what shall I do?” The days of doing as the other fellow does are over. These are the days of doing things that meet your particular conditions.

These few ideas and suggestions, then, are not so much to tell you what to do, but to tell you how to seek out those things which more nearly meet your requirements. Even in the matter of office location, conditions may be present in certain cases where it would not be most convenient to have the business room located as illustrated.

And so we have simply mentioned a few determining factors regarding shop plans, leaving the application of the rules or suggestions to the reader.



Some Practical Hints and Recipes for the Woodworker

By BENTON

A CEMENT FOR JOINING METAL TO WOOD is made by dissolving $2\frac{1}{4}$ pounds of good glue and 2 ounces of gum ammoniac in boiling water and then adding 2 ounces of sulphuric acid, drop by drop.

TO FASTEN RUBBER TO WOOD: make a cement by cutting up pure rubber into small pieces and just



A BUSY DAY AT MR. GEORGE H. STRINGER'S GENERAL SHOP OF NEBRASKA

cover it with sufficient gasoline. Allow to stand in a sealed jar until dissolved. Shake the jar daily.

TO FASTEN EMERY TO WOOD: melt together equal parts of shellac, white resin and carbolic acid crystals—adding the acid crystals after the shellac and resin have melted. This is a very strong cement.

TO POLISH WOOD: make the following mixture: Dissolve $\frac{1}{4}$ ounce of shellac and $\frac{1}{4}$ ounce of resin in $\frac{1}{2}$ pint of alcohol, and after adding $\frac{1}{2}$ pint of linseed oil shake the mixture thoroughly. Apply with a sponge or flannel and rub wood vigorously.

TO POLISH WOOD HANDLES: clean the handle first and then with a piece of flannel or waste dipped in linseed oil and then in shellac rub the handle well. Allow to stand awhile and then rub again, always dipping the cloth first in the linseed oil and then in the shellac. This produces a high polish that will not scratch or chip.

TO FASTEN TOOL HANDLES: fill the handle with powdered resin and a little rottenstone. Now heat the tang of the tool until it is quite hot and then force it hard into the handle.

A CEMENT FOR TOOL HANDLES may be made by mixing 1 part of beeswax, 1 part fine brickdust and 4 parts of black resin. This will

also hold tools securely in their handles.

TO PRESERVE AND FINISH WOOD: soak it in linseed oil for about seven days and then rub it vigorously with an oil-soaked cloth a few minutes every day for about a week. This is an especially good treatment for tool handles, gun stocks and such other wood parts as you wish to preserve and polish.

AN EBONY FINISH FOR WOOD is made by mixing 1 pound of logwood, $\frac{1}{2}$ pound of tannic acid and $\frac{1}{2}$ pound of sulphate of iron. Apply this to the wood hot and polish when dry and cold.

TO RESTORE BRUISED WOOD. The surface of tables, polished wood stands and other articles are often dented and bruised. To restore, wet the spot with warm water. Then fold a piece of common brown paper five or six times, soak it in water and lay it on the bruised spot. Now apply a hot flatiron to the paper until the moisture is evaporated. Repeat this until the wood is raised level with the other surface.

How to Build A Two-Wheeled Slat Cart

J. L. H.

This is a style of vehicle especially popular with country people located at a distance from town or station. It is an excellent vehicle for quick

THE AMERICAN BLACKSMITH

trips to any destination, and can be easily arranged to carry light luggage and merchandise without overtaxing the capacity of the springs. A small animal will draw this cart at a surprising speed compared with that at which he will travel with a four-wheeled vehicle.

The engraving, Fig. 1, shows the general appearance of the finished cart. Fig. 2 shows a side elevation of the vehicle and Fig. 4 shows a rear elevation, from which an excellent idea can be had of the style of the vehicle and the method of suspension.

The body has sills of $2\frac{1}{2}$ by $1\frac{1}{4}$ -inch ash. The back bar is lapped to the sills. The drop as well as the sides are $4\frac{1}{2}$ by 1-inch white-wood and are screwed to the inside of the sills at the front. The front

are lapped evenly into the seat rails. In the center is a flat bar with a long slot in it. A bolt from the seat bottom slides in this slot. A wing or thumb nut underneath holds the seat securely in the proper position.

The suspension is a platform. The hole in the side springs is placed two inches back of the center. This places the wheels back far enough, and at the same time the cross spring will be as close as possible to the body.

To prevent the body from answering the motions of the horse the vehicle is fitted with an arrangement consisting of two pivots and two regulating springs. The pivots are part of the steps. Their construction is shown at A in Fig. 5. The shackle fitting at B, Fig. 5, is secured underneath the shaft. It

at Fig. 1 it appears as if fastened to the shaft bar, but this is not correct. The body is 3 feet 5 inches on the sill, 2 feet 4 inches wide on the bottom and 2 feet 6 inches on the top. The total height of side is 1 foot 6 inches. The panel is 12 inches high and 2 feet 2 inches long on the top edge. The wheels are 3 feet 6 inches high with 1-inch spokes and tires.

If the wood is carefully selected and, after building, is neatly and smoothly cleaned up, nothing gives more style and distinction than to finish in the natural color. The iron-work should be painted black or a light grey. The latter color is very pleasing in conjunction with the natural color of the wood. The trimming of the cart should be of corduroy—it wears well, does not

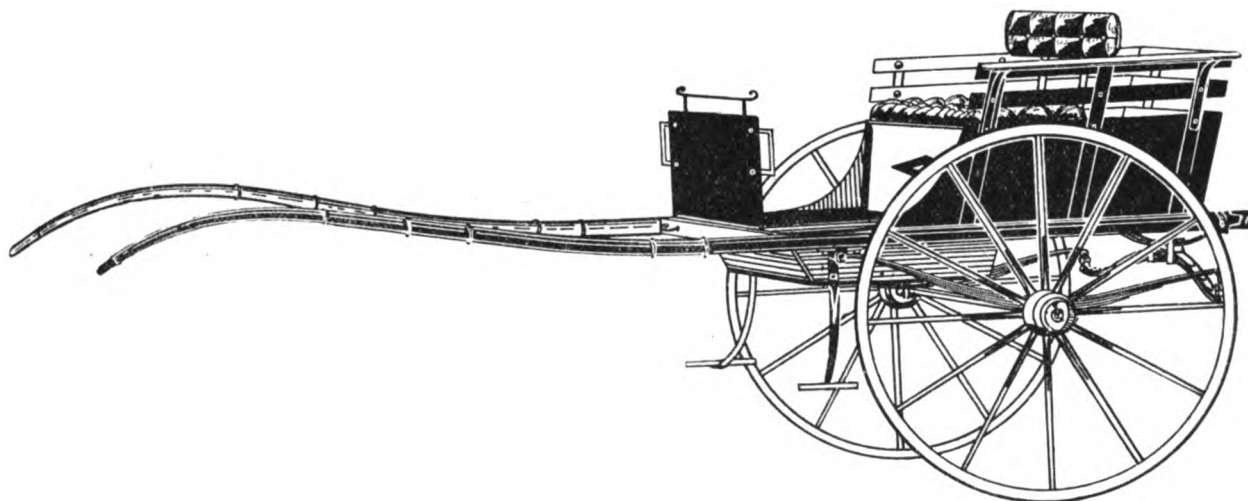


FIG. 1—THE VEHICLE WILL BE IN EXCELLENT STYLE IF FINISHED IN THE NATURAL WOOD

and back bars of the well are checked into these pieces. For the panels and slats select the best figured white-wood you can get. Of course, if the vehicle is to be finished in colors, these pieces won't make any difference. But if finished in the natural wood, the more distinctive the figures or grain in the slats and panels, the better will be the appearance of the vehicle.

The panels are glued to the sills and the back bar. The standards should be of red oak and $1\frac{1}{4}$ by $\frac{5}{8}$ -inch in size. These are bolted through the sills and the slat rails, which are on the top of the panels and inside. At C in Fig. 5 is shown a sectional side view of the body, showing the crossbars and bottom board. At D, Fig. 5, is shown a top view of the balance-adjusting mechanism. The two cross pieces

fits over the front end of the springs while the shank of the piece A goes through both shackle and spring.

To the center of the cross spring in the rear is fastened a leaf of spring steel. This piece is bent properly, so it can be clipped to the spring stay, as shown in Fig. 4. The ends of the shafts are then clipped to the ends of this spring.

The latter if made and tempered properly in connection with the shank on the step, which is the pivot, will make an extremely easy riding cart. With the pivots working freely the spring will absorb most all of the motion from the horse. The shafts are entirely independent of the body and, up to the limit of the flexibility of the spring, will move without affecting the body.

The dash is fastened to the front bar of the body. In the engraving

show the dust as darker material does and it harmonizes with the rest of the vehicle.

When colored, these carts present a very light, airy appearance with yellow undergear and wheels and a red or wine-colored body. Or, for a very flashy appearance, a light red body and gear is very fetching.

In coloring or finishing a cart of this kind it is well to consider the particular style of similar vehicles in your locality. Then, too, the buyer often has ideas of his own which he usually likes to have carried out.

The Cost of Doing Business

By ISSY BUSSY

The cost of living has been in the public eye for some time now, and

while it is by no means an unimportant matter, the cost of doing business is far more vital to the practical business smith. For, when the blacksmith knows the cost of doing business, he is more likely to be able to pay the cost of living.

But to get down to our subject—do you know the cost of doing business?

Do your books show how much profit you are making?

Do you know if you are doing business at a loss or at a profit?

Do you really know if you can afford to hire help?

Do you know—really, truly

6. Insurance, and building repairs. Do you figure on?

1. Interest on capital invested.

2. Losses on bad accounts.

3. Lawyers' fees, and costs for collecting.

4. Advertising costs.

5. Donations and subscriptions.

6. A salary for yourself.

Do you know that a man who knows the cost of doing business is seldom if ever a price-cutter?

Do you know that the less credit you give the more money you'll have with which to do business?

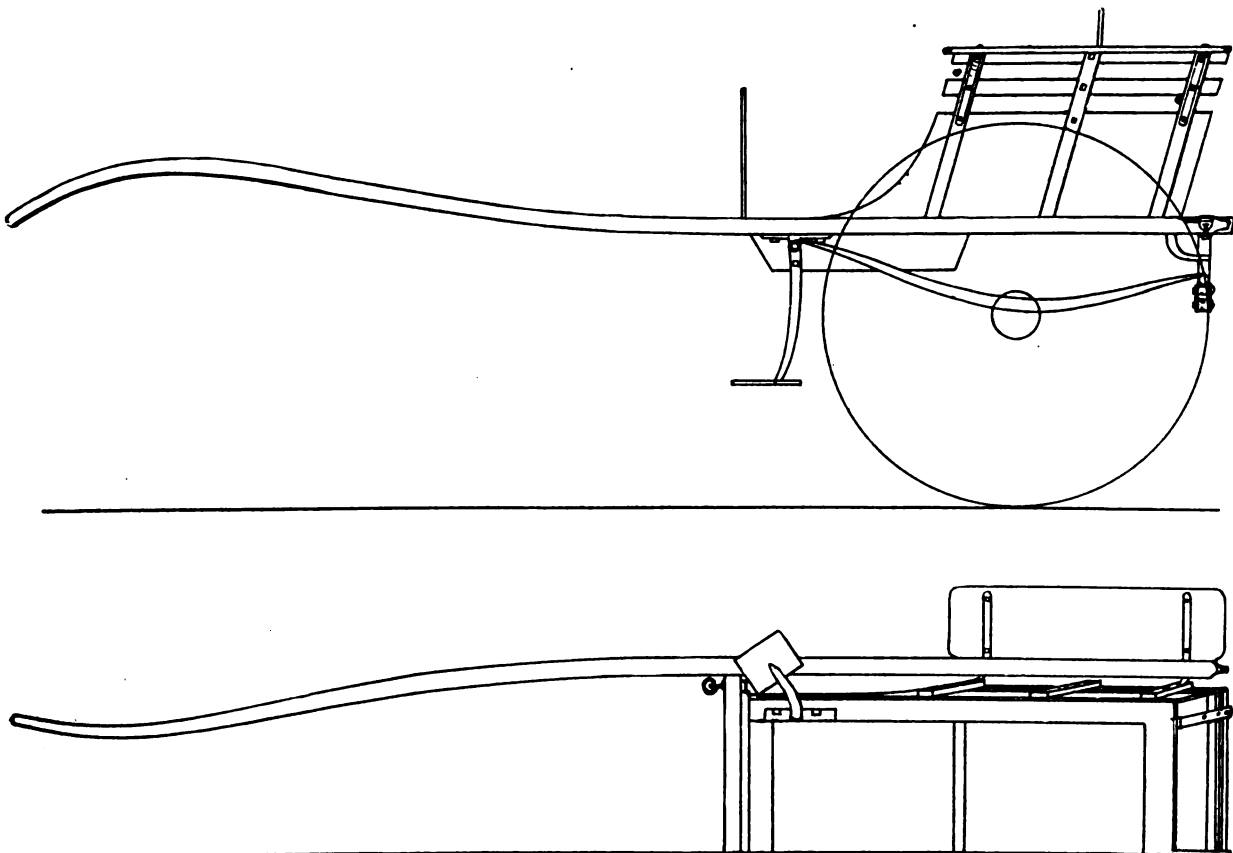
Do you know that the blacksmith who pays promptly can buy cheaper

Gasoline and Alcohol Tests on Internal-Combustion Engines—2

ROBERT M. STRONG

9.—Alcohol diluted with water in any proportion from denatured alcohol, which contains about 10 per cent of water, to mixtures containing about as much water as denatured alcohol can be used in gasoline and alcohol engines if they are properly equipped and adjusted.

When used in an engine having a constant degree of compression, the amount of pure alcohol required for



FIGS. 2 AND 3—SHOWING A SIDE ELEVATION AND ALSO A BOTTOM PLAN OF THE TWO-WHEELED CART

know—anything, according to actual figures, about your business?

Do you really know if you can afford to install another forge or drill or anything else?

Some business men figure on profits that turn into losses at the year's end—do you?

Do you keep track of?

1. Rent or taxes.

2. Salaries (owner's included).

3. Freight charges.

4. Books, postage, stationery and office supplies.

5. Fuel, lights, telephone and water charges.

than the smith who uses "long credit"?

Do you know that when you buy cheaper than a competitor you make a profit before you sell the goods or do the work?

Do you know that the smith who knows the cost of doing business is less likely to extend unwise credit—is more likely to do a profitable business—is more likely to get better prices from jobbers.

Do you know the cost of doing business?

any given load increases and the maximum available horsepower of the engine decreases with a diminution in the percentage of pure alcohol in the diluted alcohol supplied. The rate of increase and decrease respectively is such, however, that the use of 80 per cent alcohol instead of 90 per cent, or denatured alcohol, has but little effect on the performance of the engine; so that if 80 per cent alcohol can be had for 15 per cent less cost than 90 per cent alcohol and could be sold without tax when denatured it would be more economical to use the 80 per cent alcohol.

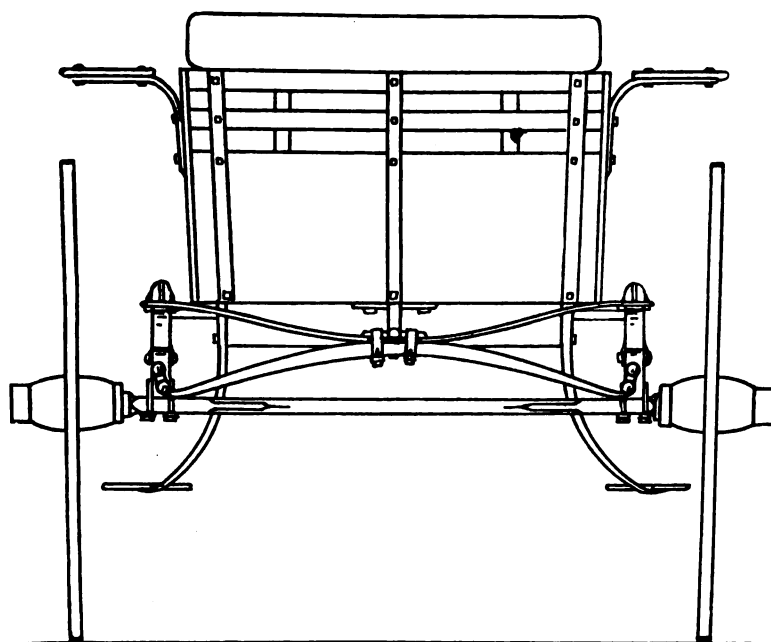


FIG. 4—A REAR ELEVATION OF THE CART, SHOWING SUSPENSION

When an engine is supplied with diluted alcohol, the compression pressure that can be used without causing preignition increases with an increase in the percentage of water by weight in the mixture, but no tests were made to determine the effect of increased compression pressure on the economy with which diluted denatured alcohol could be used.

10.—The relative hazard involved in the storage and handling of gasoline and denatured alcohol is of particular importance in considering their use as fuels for marine and factory engines and engines to be placed in the basements of office buildings, in coast-defense fortifications or in like places where a general fire would be likely to result from the accidental burning of the fuel stored or carried for immediate supply or where the forming of explosive or inflammable mixtures of the fuel vapors and air in the immediate vicinity would be hazardous.

It is indicated by statistics and is also the general consensus of opinion of those experienced in handling gasoline, kerosene and alcohol that the hazard involved in the use of denatured alcohol is very much less than in the use of gasoline and possibly less than in the use of kerosene, but as yet the relative fire risk has not been definitely established. Considerable work has been done on this phase of the investigation and a series of tests intended to be of assistance in determining the relative hazard in-

volved in the use of these fuels were made by the technologic branch of the United States Geological Survey at the testing station in Pittsburg, Pa.

11.—In regard to general cleanliness, such as absence of smoke and disagreeable odors, alcohol has many advantages over gasoline or kerosene as a fuel. The exhaust from an alcohol engine is never clouded with a black or grayish smoke, as is the exhaust of a gasoline or kerosene engine when the combustion of the fuel is incomplete and it is seldom, if ever, clouded with a bluish smoke when a cylinder oil of too low a fire test is used or an excessive amount supplied, as is so often the case with a gasoline engine. The odors of denatured alcohol and the exhaust gases from an alcohol engine are also not likely to be as obnoxious as the odor of gasoline and its products of combustion.

12.—Very few alcohol engines are being used in the United States at

the present time and little has been done toward making them as adaptable as gasoline engines to the requirements of the various classes of service. Engines for stationary, marine and traction service, automobiles, motor trucks and motor railway cars designed especially to use denatured alcohol have, however, been tried with considerable success.

The price of denatured alcohol is greater than the price of gasoline, and the quantity of denatured alcohol consumed by an alcohol engine as ordinarily constructed and operated is in general relatively greater than the quantity of gasoline consumed by a gasoline engine of the same type. Considerable attention is being given to the development of processes for the manufacture of alcohol from cheap raw materials which are generally available, and it seems reasonable to expect that the price of denatured alcohol will eventually become as low as or lower than the price of gasoline, especially if the price of gasoline advances. It also seems reasonable to expect a greater general improvement in alcohol engines than in gasoline engines.

When used as a fuel, denatured alcohol is not always so classed as to be exempt from restrictions placed on the use of gasoline by the rules of insurance and transportation companies or city ordinances. The restrictions that are placed on the use of denatured alcohol are, however, never greater than those placed on the use of gasoline. In some places they are such that the use of an alcohol engine is permitted where the use of a gasoline engine is prohibited. For instance, alcohol motor trucks and automobiles are admitted to many of the steamer piers in New York that are not open to gasoline machines.

Where the restrictions placed on

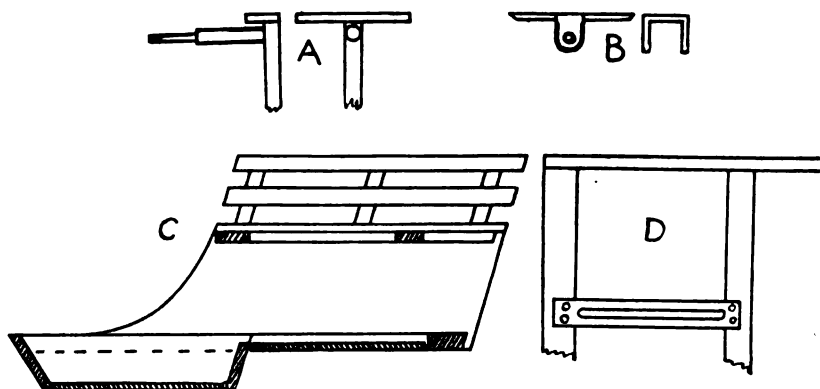


FIG. 5—SHOWING DETAILS OF CONSTRUCTION OF TWO-WHEELED CART

the use of denatured alcohol are less than those placed on the use of gasoline or where safety and cleanliness are important requisites the advantages to be gained by the use of alcohol engines in place of gasoline engines may be such as to overbalance a considerable increase in the fuel expense, especially if the cost of fuel is but a small portion of the total expense involved as is often the case. Denatured alcohol will, however, probably not be used for power purposes to any great extent until its price and the price of gasoline become equal and the equality of gasoline and alcohol engines in respect to adaptability to service required and quantity of fuel consumed per brake horsepower, which has been demonstrated to be possible, becomes more generally realized.

A further general development in the design and construction of engines that use kerosene or cheaper distillates and the crude petroleum may be reasonably expected and may delay the extensive use of denatured alcohol for some time to come, but as yet comparatively few data pertaining to this phase of the general investigation are available. Some investigations relating specifically to the extent and economy with which these cheaper oils can be used as fuels for internal-combustion engines of the types suited to various classes of service have been made at the

Pittsburgh testing station, now a part of the Bureau of Mines.



The New Henderson Motor Car

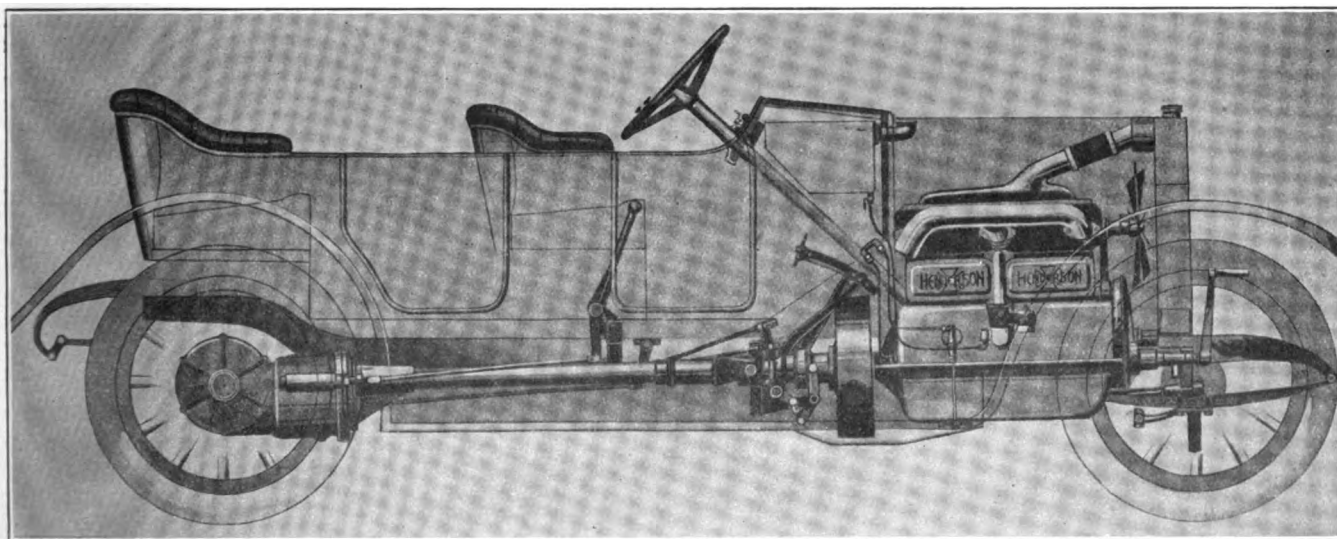
While the Henderson car features decided novelties in the way of gear shift control and gasoline tank location, judged by the contemporary American design, even these features have the sanction of leading foreign designers. The remainder of the car follows well tried practice.

The general specifications of this car include a four cylinder, $4\frac{1}{8}$ by $5\frac{1}{4}$ inch motor of the L-head type, suspended at three points; a leather faced cone clutch; the famous Stutz rear system, the same type being

supplied as is used on the powerful Stutz car. The gasoline tank is located under the dash cowl. Thermosiphon circulation is employed in the cooling system. The motor has a continuous circulating oiling system and the remainder of the car is supplied with grease cups at all wearing points. An electric lighting generator is mounted on the motor crank case and driven direct.

Control Features

The ever increasing tendency toward left-hand drive and center control has not been disregarded in the design of the Henderson car, and an extremely neat and simple arrangement of the gear control lever has been worked out by the designer. This lever has a hard rubber ball end which projects through a slot between the two front seat cushions and has a forward and backward movement. The equivalent of a conventional "H" quadrant is used, but the action of crossing through the gate of the quadrant is accomplished by a vertical movement of the lever. In starting the car, the ball handle is pulled up about an inch and moved backward approximately two inches, meshing the low speed gears. To obtain the intermediate speed, the lever is pushed forward, drops down through the gate of the quadrant, and by a further movement forward causes the engagement of the intermediate gears. Simply pulling the lever back then gives the high speed.

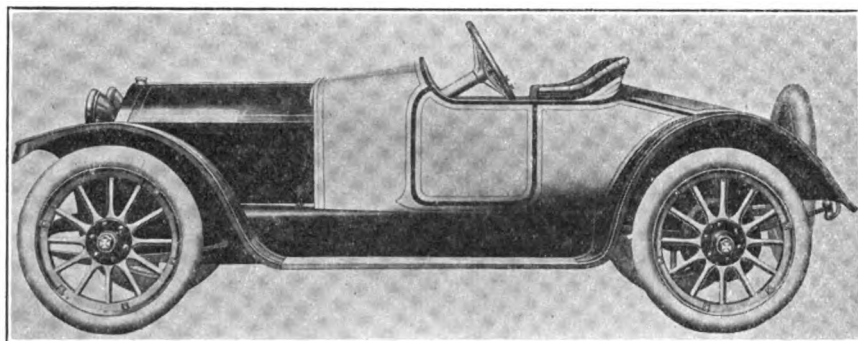


AN X-RAY VIEW OF THE HENDERSON TOURING CAR, SHOWING THE MOTOR AND TRANSMISSION

The quadrant is so arranged that in going from low to second speed there is no danger of accidentally continuing forward along the upper side of

hollow and of large diameter, and are secured in the piston bosses by cap screws which project through them. The connecting rods and crankshaft

of the gasoline tank under the dash cowl gives a drop of 16 inches between the bottom of the gasoline tank and the float level in the carburetor, and insures a good flow of fuel under all conditions. At the same time the carburetor is higher than usual, giving a short intake pipe. A water jacket is provided on the carburetor for the purpose of supplying heat in cold weather. The capacity of the gasoline tank is about fourteen gallons.



THE HENDERSON ROADSTER IS A COMPACT LOOKING CAR

the "H" and engaging the reverse gears unintentionally.

The clutch is a leather faced cone having a diameter of $15\frac{3}{4}$ inches and a face of $2\frac{3}{4}$ inches; the angle of the face being $12\frac{1}{2}$ degrees. It is operated in the conventional way by the left pedal, through the medium of a ball thrust collar. The spring tension may be adjusted, if necessary, by removing the universal joint at the clutch. A toggle action is interposed between the pedal and the clutch collar, relieving the operator's foot of practically all the clutch spring pressure after the pedal has been moved two inches or so. A further movement of the same pedal applies the service brake. The right pedal is ratchet retained and controls the emergency brake.

Long Stroke Power Plant

The Henderson Motor has a stroke-bore ratio of 1.27; the stroke and bore of the cylinders being $4\frac{1}{8}$ inches and $5\frac{1}{4}$ inches, respectively. The valves are arranged on the right side of the motor, on account of the left-hand drive feature, and are actuated by mushroom tappets. The tappets are provided with hardened screws and set nuts at their upper ends for the purpose of adjustment. Cast-iron guides are provided for the valve stems. The valve heads are $2\frac{1}{8}$ inches in diameter and have a lift of about $\frac{3}{8}$ inch.

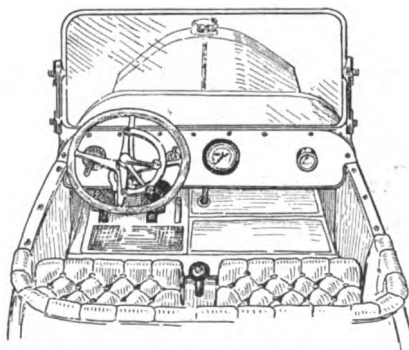
A single casting includes all four cylinders and the intake manifold. Ample water spaces are provided around the valves to insure free circulation. The top of the water jacket is covered with a casting which also forms the water outlet pipe.

The pistons are provided with four eccentric rings. Wrist pins are

are drop-forged from alloy steel and heat-treated. The main bearings are three in number and are two inches in diameter. The crank case is a ribbed aluminum casting having the bearings supported in the top half.

The camshaft is a forging and has a large bearing at the front where the side pressure due to the driving gear is absorbed. This bearing is of phosphor bronze and has a diameter of two inches and the same length. The driving gears are cut helical.

The lower half of the crank case forms an oil reservoir and is divided horizontally into two parts. The upper portion has a depression under each connecting rod into which the bottom of the rod dips at each revolution of the crank. Holes are provided at the proper level so that the excess oil falls back into the lower part. A plunger pump, operated by



SEAT AND DASH ARRANGEMENT OF THE HENDERSON CAR

an eccentric on the camshaft, takes the oil from this pump and forces it through a sight feed on the toe board to the three main bearings. The remainder of the motor parts are splash-lubricated.

The carburetor is of Schebler make, $1\frac{1}{4}$ inches in diameter. The location

Lighting Generator Drive

The Ward Leonard lighting system is standard equipment on all Henderson cars. The generator is mounted on a pad forming an integral part of the crank case and is driven from the crankshaft by gears corresponding to the crankshaft gears on the other side of the motor. The generator rotates at engine speed and is designed to carry the entire lighting load when the car is traveling at ten miles an hour or faster. At lesser motor speed, the battery which is situated under the front seat is called upon to furnish the lighting current. The same battery furnishes ignition current for use in starting.

A Remy magneto is fitted and is driven from the lighting generator shaft, the two instruments being mounted in line with each other on the left side of the motor. The switch is placed on the board at the rear of the dash cowl, together with the other instruments.

Transmission Unit with Axle

The three-point suspension idea is carried out in the rear system as well as in the motor. The yoke at the front end of the torsion tube is supported by a cross-member of the frame through two pins of large diameter and is free to turn on the torsion tube itself, so that a universal action is obtained. The transmission is of the usual three-speed type with shafts supported on ball bearings. The gears are cut from nickel steel forgings. The rear axle proper has a bevel differential. The three quarter floating construction is used; roller bearings being employed to carry the shafts. The latter are of nickel steel and have squared ends with a conical collar just inside the squared end that receives the wheel hub. The hub has a similar tapered hole and is forced into place with a nut, this construction giving a rigid and strong fastening. The brakes

are both of the internal expanding variety, placed side by side inside of 14-inch drums. Both brakes are operated through equalizers. Adjustment of both brakes may be made on turnbuckles situated under the front floor boards and locked by wing nuts. No tools are required for this adjustment.

The front axle is an I-section drop-forging, dropped between the spring pads. The tie rod is in the rear of the axle. The springs are semi-elliptic in front, 38 inches long, and three quarters elliptic in the rear, 50 by 2 inches. The frame is of channel section, 4 inches in depth. It is inswept at the front to allow a short turning radius and has a kick-up of $5\frac{1}{4}$ inches at the rear to allow spring action in connection with a low frame.

The Gemmer steering gear uses a worm and complete gear. The steering column shows for only a short distance down from the wheel, since it runs through the rear-board of the cowl. A 17-inch wheel is fitted.

The dash lamps are set into the dash. The tail light and number-plate holder are arranged in combination with a tire carrier at the rear of the car.

A Machine for Making Coil Springs

J. F. RUDD

The accompanying engraving shows an easily made machine for turning coil springs quickly and easily. The shaft, A, is made the same size as the diameter of the spring which you desire to coil. The part, B, is movable to allow for different lengths of springs. It has a number of holes drilled into its base part, so that the distance between the two uprights can be lengthened and held rigidly with a bolt or pin. The piece, C, is bolted solidly to the base piece, D, which in turn is bolted to a bench or post. The upright part of piece C has a U-shaped end. The shaft, A, is slipped into the hole in B and then dropped into the slot at C. A pin, E, is then pushed into place to hold the shaft, A. Shaft A is fitted with two collars, one on each side of the piece, C. These collars keep the shaft from slipping. A hole in the inside collar at F holds the wire and keeps the spring turning with the shaft as it is turned by the handle.

To coil a spring, bend enough of the end of the wire to go into the hole in the collar at F. Insert this end in hole, and hold wire taut while turning the handle. You can make a good close coil on this machine very quickly and easily.

Managing Your Business With Your Eyes Open

A. M. BURROUGHS

Mere hard work will not bring success. There must be behind the work a "know-how" that will make it accomplish something

A retail hardware man kept himself so busy with the little things of his business that he had no time to make money. But when he analyzed his methods, himself, his business, to find the reason he wasn't making money, he found he could unload half the petty work he was doing onto a \$3-a-week boy.

Then he began to understand that it was his business to manage, to

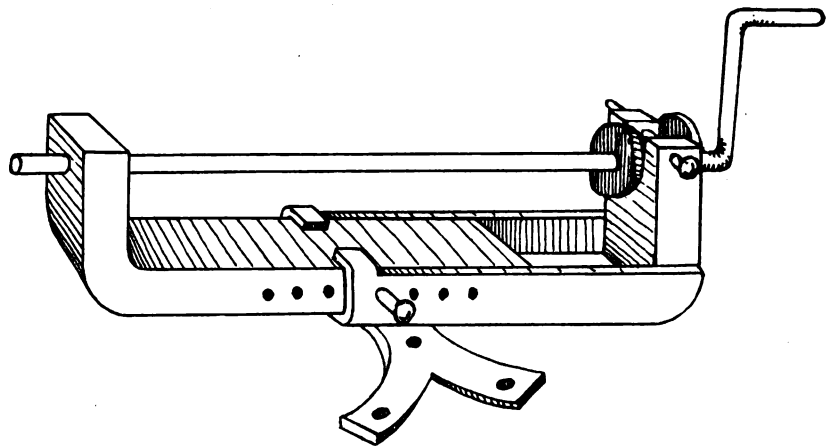
grocery store in the German quarter of a New England city. Here he learned the grocery business.

Before he was twenty he was made manager of the store. When he was twenty-one he was appointed manager of a bigger Jersey City store. Now, at twenty-three, he is manager of a \$250,000 store in Illinois, with seventy-five employees.

If you would ask him how he succeeded he would tell you that he always made it a point to know the results of his efforts.

When he went into a new store he wanted to know which lines of goods paid a profit and how much. And he wanted the information all the time, not merely for a few days.

He wanted to know whether one of the lines which wasn't moving began to produce a profit when it was put "up front," and whether it continued to show a profit after it was put back to give some other slow line a chance.



AN EASILY CONSTRUCTED DEVICE FOR MAKING COIL SPRINGS

think, to plan, to find out why things should be done and how they could be done in the best way.

He found that anybody could do the things that had to be done, if he told them how.

He quit using the brains, the enthusiasm, the energy of his business for the "office-boy" duties. He devoted himself to the management of his business.

Now he is a merchant prince, the head of a great hardware concern, with an income several times bigger than his gross business used to be.

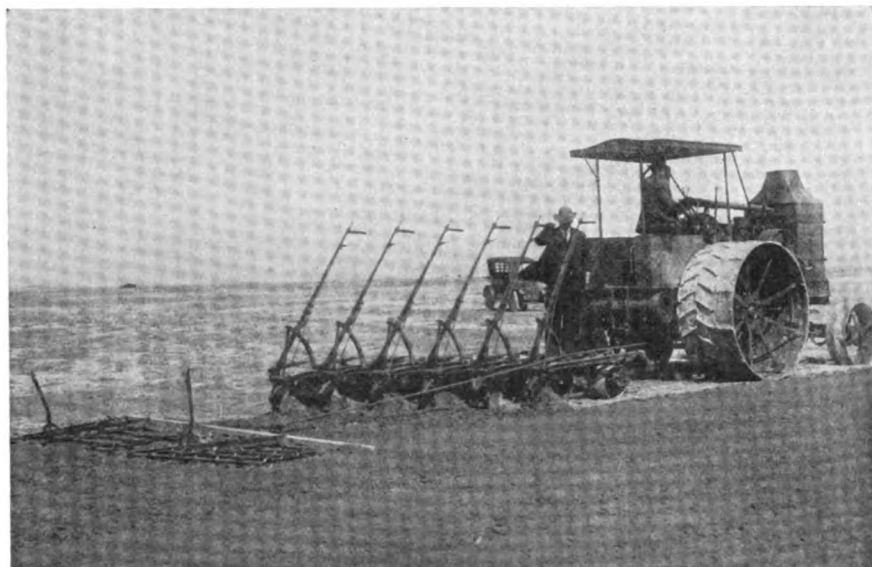
A young German came to this country twelve years ago at the age of eleven, with but \$3 in his pocket and not a word of English in his vocabulary.

He obtained employment in a

He demanded records that showed him whether clerk No. 1 was producing a profit. When he found out which of the clerks produced the most profit he used him as a standard for the other clerks—or their successors—to work up to.

A certain hardware dealer appealed to his jobber for a solution of a problem which he was wise enough to know was gradually pulling him down.

His business was increasing—much faster than his expenses—but at the end of the year he couldn't find the profit he thought he should have. He had a good business. He was working hard, trying to plan and manage his business. He was a resourceful, industrious, clever merchant. Yet he wasn't making money.



**THE AMERICAN FARMER IS MAKING THE GAS TRACTOR DO HIS WORK—
THIS TRACTOR IS PULLING SIX PLOWS AND A HARROW**

When his jobber sent an accountant to go over his books it was found that his books didn't really tell him anything about his business. He kept accounts that didn't account.

He couldn't find out, for instance, whether it paid him to make a big window display of pipe wrenches, at a big discount off the marked price, to attract plumbers and gasfitters to his store.

He didn't know, for sure, whether his big assortment of knives was paying him.

In fact, he didn't know anything for certain.

He was wasting his energies, his enthusiasm and his brains by planning and doing things that never got him anywhere.

With the aid of an accountant he put in a bookkeeping system which enabled him to get accurate reports on the results of each day's effort.

Then he was able to know, pretty quick, which line of effort produced the best results, the most profits.

Now the difference shows in his bank balance and the fine home he owns—his business has more than quadrupled in two years.

Yet he is the same manager, in the same store, selling the same goods. He has just cut out the unprofitable methods.

He wasn't incompetent before. He is no better manager now. He is just managing with his eyes open.

(Copyright, Burroughs Adding Machine Company)



**THE FARMER OF BRAZIL USES BOTH HORSES AND OXEN TO AID HIM
IN CULTIVATING THE GROUND**

The Blacksmiths and Carriage Makers of Northwestern Pennsylvania

The fourth annual picnic of the Northwestern Pennsylvania Blacksmiths' Association was held on August 17th, at Waldameer Park, near Erie, Pennsylvania.

Members of the Association from Cambridge Springs, Girard, Edinboro, Waterford, Corry, Northeast, Harborcreek, Fairview and all nearby towns attended and assisted in making the occasion a most successful affair.

The program of the day began with a very fine dinner, which was served by the ladies and Mr. L. E. Stancliff, without whom no Erie blacksmith affair would be complete. After dinner, Mr. W. O. Bernhardt spoke to the blacksmiths on "Blacksmith Prices and the High Cost of Living."

Athletic contests, races and a baseball game then followed. Several novelties were introduced, of which the most interesting was probably the nail-driving contest for the ladies. Each lady contestant was required to drive a certain number of spikes into a hardwood plank. The ones driving them in the shortest time received prizes. The athletic events were held under the supervision of Mr. Stancliff, Mr. Shenk and Mr. Thibaut of the Association, and Mr. Blair of the United States Horse-shoe Company, who acted very efficiently as timer and scorekeeper.

The Association of Northwestern Pennsylvania takes in most all of the shops in the territory covered, and is progressing. The men are well organized, and led by such men as L. E. Stancliff, J. M. Shenk, Web Ziegler and others they cannot help but succeed in bringing about such reforms as are needed to secure the proper prices and proper recognition for their work and craft.

Opportunities

Here are listed a number of live opportunities for live blacksmiths—towns and localities where blacksmiths are needed. If you want to start anew and if you have the necessary energy, skill and perseverance to

THE AMERICAN BLACKSMITH

stick to business until business sticks to you, get into touch with these business chances. Write to the man or firm named under each address.

Mississippi:

At Stonewall—Address J. D. Puister.
At Valley—Address W. W. Bedwell.
At Roundlake—Address Louis Burta.

Missouri:

At West Alton—Address Pejett & Cottle.

Montana:

At Centerville—Address I. J. Bennett & Co

At Lima—Address Nelson & Sons.

Nebraska:

At Lemoyne—Address S. C. Bullock.
This is said to be good location.

New Jersey:

At Whitesville—Address L. W. Holman.
Want smith badly.
At Delmont—Address Postmaster.
At Sidney—Address J. H. Potts.
At Clover Hill—Address Postmaster.

New York:

At Tallman—Address Postmaster.

At Shokan—Address Postmaster.
At Port Kent—Address E. J. Pickle.
At Patchin—Address M. Flickinger, R. F. D., Boston.
At Wawarsing—Address W. M. Jansen.
At Randall—Address J. A. Miller.
There is said to be a good opening here for a good smith.

New Hampshire:

At East Washington—Address M. E. Hixon.

At Bedford—Address Postmaster.

At Davisville—Address Messrs. Frissell.

At West Salisbury—Address Postmaster.

Nevada:

At Ramsey—Address Postmaster.

Ohio:

At Wood—Address Postmaster.

At Western Star—Address Postmaster.

At Wolf—Address Robert Shaw, Jr.

At Weaver's Station—Address John Miller.

At West Clarksfield—Address R. A. McCann

At West Andover—Address H. L. Gregory.

At Center—Address Postmaster.

At Dickerson Run—Address J. M. F. Blake, P. M.

At Boston—Address Postmaster.

At Cassellman—Address Cramer Bros.

At Leithsville—Address A. P. Leith.

At Espyville—Address H. H. Rhoades.

This is described as an A No. 1 opening for a good all-around man.



Blacksmithing Prices and The High Cost of Living.

Money is a medium of exchange. It is something you give to another person in exchange for something you want and which they have to sell. It is the same as the wampum of the Indians, the sheep of the earlier settlers and the rings of copper in the copper country.

The value of the medium of exchange is determined by what you can get in exchange for it.

For example: If at one time you got 100 pounds of flour for one sheep, and six months later got but 75 pounds for the same sheep—sheep will have depreciated or lessened in value.

Five years ago you could purchase ten pounds of beef or pork for one dollar. Today you get but six and one half pounds of the same meat for the same dollar.

That dollar is worth less. You can't get as much for it.

AND YOU CAN'T GIVE AS MUCH FOR IT.

You cannot afford to give as much of your time, your work or your materials for one dollar as you did five or ten years ago.

You can no more afford to give as much for that dollar as you did five years ago than a grocer can afford to give one and one half pounds of sugar for the price of one pound.

Ever hear of a plumber giving an hour and a half of his time for one hour's pay?

Ever have a carpenter force a day and a half of his time on you for one day's pay?

Ever get eighteen eggs from your grocer or farmer for the price of a dozen?

Ever get fifteen kegs of shoes for the price of ten?

How then can you afford to give half again as much time, labor and materials without an increase in pay?

You can't.

YOU CANNOT AFFORD IT

And if you know what your time is worth, what labor costs, what materials cost—if you know what your costs are, you won't afford it, and you'll know why.

NOTE:—This is Number One in a series of Talks by the Editor. Each talk will be complete in itself—but will bear an intimate relation to business, prices, profits and costs. The second talk, "How's Business?" will appear next month.



THE WHEELED TOOTH HARROW AND THREE OF MAN'S FAITHFUL HELPERS

At Smithboro—Address C. E. Tucker & Son.

At Tribes Hill—Address Gordon Bros.
This is said to be a good location for a good smith.

At Blue Point—Address R. S. More.

At Lansing—Address R. B. Jones.

At Setauket—Address C. B. Tyler Est.

At Wading River—Address Postmaster.

At Levanna—Address Postmaster.

At West Taghkanick—Address Postmaster.

At West Laurens—Address Postmaster.

At Wales—Address D. E. Ford.

At South Millbrook—Address I. C. Jones.

At Milan—Address B. F. Sherow, R. F. D., Rhinebeck.

At Middle Island—Address E. Pfeiffer.

At Orangeburg—Address Postmaster.

At North Wilma—Address C. G. Lamb.

At Newton Falls—Address Postmaster.

At Meredith—Address J. M. Graham.

At Marshville—Address Bayard T. Garlock.

At Hart Lot—Address Cottle Bros.

At Coram—Address C. H. Hagen.

At Bucks Bridge—Address Oscar V. Veitch.

Oklahoma:

At McMillan—Address W. L. Winston.

At Trail—Address Arlie Russell.

Oregon:

At Jennings Lodge—Address R. F. Stover.

Good smith needed badly.

At Alicel—Address H. McKinnis.

Excellent opening for a good man.

At Pleasant Valley—Address J. H. Roland.

At Big Eddy—Address Postmaster.

At Bridgeport—Address J. J. Dooley.

At Sodaville—Address H. Seifert.

At Mecca—Address Mecca Trading Co.

At Macleay—Address R. M. Trestrail.

At Goble—Address D. Link.

Pennsylvania:

At Delano—Address J. A. Depew.

At Atco—Address Postmaster.

At Fairmount City—Address Postmaster.

At Hutchins—Address Postmaster.

At Glen Hazel—Address Clawson-Fisk Co.

At Benore—Address John Haugh.

At Crothers—Address S. D. Blayney.

At Daguschahouda—Address Valley Store Co.

Be A Sport

W. O. B.

Suppose Affliction comes a rippin'
Toward you like a pretzel curve
Do you "beat the air" and "fan out"
Like a mutt who's "lost his nerve?"
No, you stand beside the "home plate"
Hold the "willow," strike a pose.
When it comes within a bat-length
Soak Affliction on the nose.

Melancholy, like a football,
Comes a hurtling from the blue—
Do you hug him to your bosom
Like a girl that's fond of you?
Well, I guess not! You just "rush him"
For a gain "around the end,"
Then a "drop kick" safely planted
Will 'Ancholy goalward send.

When Dull Care attempts to "throw" you—
He can wrestle "like a pest"—
Don't you straightway "throw the bout"
for
You can "drop" him at his best.
Walk right up and meet his rushes
Stand against them like a rock
When he tries the "strangle hold," you
"Down him" with a "hammer lock."

If when Trouble comes a sneekin'
Up to "bif you on the top"
Do you calmly crumple floorward
Like a suncured chocolate drop?
Why of course not, you just "side step"
Feint with right, "hook left to jaw"
"Rush your lead" and then "unlimber"
Bang him hard with either "paw."

Envoy
Thus the Verse Machine keeps rhyming
While we bif Vexation's ear.
Rhyming, grinding, never stopping
Till old Sorrow's kicked to Cheer.
Now that Ruin's "slats are punctured,"
Misery's "bumped upon the bean,"
And Disaster's had a "knockout"
We must oil the Verse Machine.



What's your idea of cold setters now?
Business is business, but long credits are dangerous.
Hans Dillburger says: "Many a true verd makes short friends already."
Don't forget your dues in the B. L. How much are they? Just Boost, that's all.
If that's all you can say about "a chip off the old block" he's not worth picking up.
Take care of the pennies and minutes and success will stare you in the face.
If some shoers pared expenses the way they do hoofs they wouldn't have any bills to pay.
Can we make this publication more valuable to you?—we want to, if it's possible. Let us know.

If tomorrow never comes, wouldn't it be a good idea to postpone our worrying until tomorrow? Just try it.

When a man is so busy he has had no time to tell folks how busy he is you may be sure he is very busy.

Another new volume starts this month. Watch for new stunts. Improving ever—ever improving is our watchword.

When you meet the man with the winsome smile, the steady eye and the persuasive tongue, listen if you want to and accept his cigar, too, but do please keep a tight hold on your wallet.

Ever think that the appearance of a store was an indication of the character of the man who runs it? If the same applies to blacksmith shops, some smiths must be horrible examples.

Sense in business usually means cents in profit, but it never results in price-cutting. Business sense tells the business man that a cut in the selling price is a cut at profits and not at costs.

Ask the helper's help. He must know something or you wouldn't have hired him. Talk things over with him; you can both help each other. And you'll find him a better helper for taking an interest in his opinions.

A first-class doer of first-class work is outdistanced only by the first-class getter of first-class prices. But above them all is the smith who can combine all four qualities. He's in a class all by himself.

"Know your engine by ear" read the Editor from the page of a current trade journal. "Didn't know they had ears," put in the proofreader, laughingly. "Sure they have," yelled the office boy, "Didn't you ever hear of engineers?"

Make use of the long winter evenings by enlarging your craft knowledge. If you are in doubt as to just what books to get—ask our Book Department. They can help you—and it won't cost you one penny except for the books you buy.

Before snow flies is the time to fix up the roof. Perhaps a few shingles are all the cover needs. Then again it is sometimes cheaper to apply a layer of new roofing. Some of the patent roof coverings are cheap, good and easily applied.

How long since you've contributed to these pages? Let the Editor hear from you occasionally. Surely you know of methods, hints, kinks and recipes not generally known to the craft at large. It won't take a minute to send in something of interest.

If a smith was compelled to depend simply upon his own experience and what others told him, how much of a smith would he be? "Reading maketh a full man," and reading craft literature certainly makes work easier, success bigger and life sweeter for the worker. Tell your neighbor.

Of course, 1912 has been a good year, but 1913 must be better. Better get busy now and give the new year a good start. A running start will keep you moving easier, faster and take you farther than trying to jump into the race at the crack of the starter's gun. Try out this idea.

Friend Tardy wouldn't think of walking upstairs when the elevator is running, and yet he continues trying to do business without THE AMERICAN BLACKSMITH. "Our Journal," says Brother Weston of New York, "is like an elevator in the Singer Building—it's a mighty big help in getting to the top."

Present your bill when it is due. A bill paid when due never gets old, and the older a bill the harder to collect. Like a man, the older he is the harder it is to do anything with him. Keep the bills young and you'll always be able to handle them. And then, too, a young bill is more likely to get a real hearing in court, when that is necessary.

Your business grows—your profits increase only by adding new customers. Those who never hear of you will never trade with you. You must get your shop, name and business before the people in a favorable way. Advertise and keep at it persistently—then your business will grow—profits will increase.

Throughout the campaign, before election and after, business must go on. People will use horses, buggies and wagons—they will need engine, tractor and auto repairs no matter what side you are on. Don't let the babble, bluster and blow interfere with your work and business. Vote as YOU think best and then work regularly, confidently, cheerfully and persistently.

Ability to swing a hammer and turn a shoe quickly isn't all there is to horseshoeing. It isn't the leather apron and the big arm that makes the smith. It isn't the sign over the door that makes him a practical man. The apron, arm and sign may say certain things for years, but a five-minute observation of the man at work will tell more truly than anything just what he is.

Extend credit if you cannot do business on a cash basis. There is no objection to a credit business, except in the way it is run. Extend credit in a business-like manner. Ask your prospective credit customer where he's been trading—where he buys other goods. And then look up his record and let your answer be in accord with your findings.

No business can be run on the money that is chalked up on the books. If you've got a list of old accounts, make a big, hard try at collecting them. Clean up the old bills—sue where necessary, and then start with a clean slate. You'll feel more like pushing business and are more likely to make money. Worth trying, anyway; and it won't cost you a cent, but will put money in your pocket.

Did you ever see a "quack medicine," "fake gold-mine" or other questionable advertisement in these columns? THE AMERICAN BLACKSMITH stands back of its readers—it protects them. Our Pink Buffalo Stamps and Our Honest Dealings Paragraph prove it. You need not be afraid of answering the advertisements in "Our Journal." Fakers can't buy space in this paper at any price.

Modern tools and machines are making the business and work of blacksmithing lots easier these days. Electric blowers, calking machines, power drills and shears, universal woodworking machines, tire setters and power hammers are giving the smith a chance to do more work and do it quicker, better and easier. Are you still using granddaddy's tools? Better switch onto modern methods before you're a granddaddy.

If there were such things as gloom factories we would recommend Tom Tardy's shop as one with a first-class proprietor. Tom hasn't smiled, except at the corner wet goods establishment, in goodness only knows how long. Perhaps we only imagine it, but it seems to us that a big black cloud is continually hovering about Friend Tardy's head. Maybe a good broad smile will disperse it, Tom.

When you hire a carpenter, plumber, bricklayer, mason or other craftsman to do work on your house can you pay him with what you make in a similar period of time? If you can, you are to be congratulated and we'd like to have your name and address. Isn't it most time that blacksmiths got as much for their time and labor as these other workers? Isn't it time the smith made a comfortable living instead of a mere existence? Isn't it time to join hands in the common cause of price betterment and craft enlightenment?

Our Honor Roll

Twenty-Six New Names

There are twenty-six new names on this month's Honor Roll. And just look at the way the Class of 1922 is growing. Every month adds several new names to the 1922 Class and it keeps up a steady growth. If you want to get into this class, better send your order now—today. You see, if your account expires with the October issue, all you need do is to send us a money order, check or express order for \$5.00 (\$7.00 if you live in Canada and 1£, 14s., if you live in Great Britain, South Africa or Australia). This amount will put you in the 1922 Class—will pay your subscription up to October, 1922.

Insure your subscription account by taking advantage of our long-time rates.

If your account is paid up to 1915 only, get up among the leaders by sending in a five-spot.

You save money, time and trouble by taking advantage of our long-time rates.

Show your neighbor this list—tell him what the paper has done for you. A paper must be a pretty good one to have a list of subscribers like this one.

And don't forget the thousands of subscribers who are paid up to 1913, 1914 and 1915.

Figure out a place for yourself, and then save some money.

	U. S. and	Mexico	Canada	Other
Two years.....	\$1.60	\$2.00	10 shillings.	
Three years.....	2.00	2.70	14 shillings.	
Four years.....	2.50	3.20	18 shillings.	
Five years.....	3.00	3.75	1 pound.	
Ten years.....	5.00	7.00	1 pound 14s.	

And then, too, you can gain a place on Our Honor Roll by getting new subscribers. Just show this big list of honor readers to your brother craftsmen. A paper must be pretty good to get a practical man's subscription years and years in advance. Then send in the new subscription orders and we will give you six months' credit on your own account for each new order you send us. That will help you toward an honor place. Will you tell your neighbor?

NAME	Subscription Paid to	NAME	Subscription Paid to
W. C. WATT, Kan.	Dec., 1930	J. M. BROWN, Texas	Apr., 1917
I. J. STITES, N. J.	Jan., 1928	J. C. WOODS, W. Aus.	Mar., 1917
W. R. TURNER, Man.	Oct., 1923	C. BOULTON, N. S. Wales	Mar., 1917
T. BRADLEY, N. S. Wales	Mar., 1923	C. A. HAWKINS, Ore.	Mar., 1917
W. LAWSON, N. Z.	Nov., 1922	A. L. MONTGOMERY, W. Va.	Mar., 1917
J. TOMKIEWICZ, Que.	Sept., 1922	J. PETERSON, Ia.	Mar., 1917
A. PETERSON, Ohio	Aug., 1922	J. ANDERSON, Tas.	Mar., 1917
J. ERMAN, Ark.	July, 1922	A. J. NEILL, Vt.	Mar., 1917
ROBERT TOCHTER, Cal.	June, 1922	ED. DETTRICH, Ind.	Mar., 1917
E. ANDERS & SON, S. Aus.	May, 1922	LEWIS CHASE, N. Y.	Mar., 1917
LOUISA CARRIAGE Wks., Va.	May, 1922	E. O. LEE, S. Dak.	Mar., 1917
S. SMITH, Tex.	Apr., 1922	S. STIMPLE, Ohio	Mar., 1917
J. W. HAAR, La.	Mar., 1922	R. S. GUGISBERG, Kan.	Mar., 1917
E. A. DILLON, Nev.	Mar., 1922	J. S. HASKELL, Col.	Mar., 1917
D. W. SMITH, R. I.	Mar., 1922	W. L. ROARK, Tex.	Mar., 1917
D. F. KUSTER, Wash.	Mar., 1922	A. R. BARLOW, Texas	Mar., 1917
B. H. KEITE, Ia.	Jan., 1922	C. A. WHITACRE, Ohio	Mar., 1917
O. M. JOHNSON, Minn.	Oct., 1921	B. P. CARNEY, Ill.	Mar., 1917
H. FELDUS, Neb.	Sept., 1921	H. SCHNETTE, Ill.	Feb., 1917
W. K. KLING, Kan.	May, 1921	E. DOUGHERMAN, Ohio	Feb., 1917
ED. GRIMM, Texas	May, 1920	J. W. HAUGHT, Ill.	Feb., 1917
B. S. CRISLER, Ky.	Jan., 1920	CHAS. F. GIESSE, N. Mex.	Feb., 1917
I. M. TOWNSEND, Cal.	Apr., 1919	M. E. GOLLER, Pa.	Feb., 1917
C. WILLIAMS, W. Aus.	Mar., 1919	J. POTTHOFF, Neb.	Feb., 1917
T. P. CONSIDINE, Mass.	Dec., 1918	G. M. GARETT, Mich.	Feb., 1917
A. DISCHER, Aus.	Aug., 1918	ERNEST FINLEY, Pa.	Feb., 1917
RICHARD BRENNER, Tex.	Feb., 1918	A. TILLMAN, Cal.	Feb., 1917
W. F. HILL, N. C.	Feb., 1918	WALKER BROS., N. Z.	Feb., 1917
P. J. DALL, W. Aus.	Jan., 1918	G. W. WHITTINGTON, W. Va.	Feb., 1917
J. MORROW, Pa.	Jan., 1918	J. H. HOYLE, S. Africa	Feb., 1917
Mess Bros., Vict.	Dec., 1917	IRVING BROS., N. Y.	Feb., 1917
B. A. STRINKER, Ohio	Nov., 1917	F. ROSCHY, Pa.	Feb., 1917
J. N. BATHGATE, N. Dak.	Nov., 1917	AUGUST MILLET, Ill.	Feb., 1917
W. C. RONEY, Pa.	Oct., 1917	C. P. ROBERTSON, S. Africa	Feb., 1917
J. N. MILLS, Ky.	Oct., 1917	S. HETEM, S. Africa	Jan., 1917
F. HOWARD, Kan.	Aug., 1917	G. A. GURLEY, Ore.	Jan., 1917
H. FERREL, Ill.	Aug., 1917	F. K. WADE, Me.	Jan., 1917
J. McMEIKEN, N. Z.	Aug., 1917	L. V. SENN, Neb.	Jan., 1917
F. H. GIERKE, S. Aus.	Aug., 1917	L. H. AUSTIN, N. Y.	Jan., 1917
H. J. DEVONSHIRE, N. Z.	July, 1917	H. KAHN, Ia.	Jan., 1917
V. J. HUBBARD, N. Y.	July, 1917	J. H. BERGEN, Kan.	Jan., 1917
W. R. GELLING, S. Africa	June, 1917	F. G. A. WILLIAMS, S. Aus.	Jan., 1917
J. H. BAKERBERG, S. Africa	June, 1917	ALFRED CASS, N. Z.	Dec., 1916
A. R. HALLENBECK, N. Y.	June, 1917	H. GRIMM, Utah	Dec., 1916
F. C. BOCK, Neb.	June, 1917	A. H. GOODING, S. Aus.	Dec., 1916
YOST & HALVORSON, Minn.	May, 1917	LEONARD SMITH, N. J.	Dec., 1916
W. McCOT, Kan.	May, 1917	C. F. SHAW, Man.	Dec., 1916
A. GUTTLER, Tex.	May, 1917	W. ELWARD, Pa.	Dec., 1916
C. F. J. LORENZ, N. Y.	May, 1917	W. W. EGLY, Pa.	Dec., 1916
A. DATWYLER, Ohio	May, 1917	JOS. BOYER, Mich.	Dec., 1916
H. G. MARRIOTT, Utah	Apr., 1917	J. WILLIAMS, N. S. Wales	Dec., 1916
E. THIBAUDEAU, Wis.	Apr., 1917	J. H. W. SCHNEIDER, Cal.	Dec., 1916
W. PICKERING, S. Africa	Apr., 1917	W. SAUER, Minn.	Dec., 1916
ED. BURROWS, England	Apr., 1917	F. F. DARLING, Cal.	Dec., 1916
L. KAUSCH, Wis.	Apr., 1917	CHAS. NEWLAND, Cal.	Dec., 1916

NAME	Subscription Paid to	NAME	Subscription Paid to
J. T. BRAHM, Ia.	Dec., 1916	J. N. TYLER, Ohio	Feb., 1916
P. H. ST. LOUIS, Wis.	Dec., 1916	CHAS. H. KERN, Ill.	Jan., 1916
A. E. NICKOLA, Okla.	Dec., 1916	J. H. ECROYD, Cal.	Jan., 1916
C. J. HALL, Wash.	Dec., 1916	THOMAS HORNE, Ariz.	Jan., 1916
BOB FRICK, Ala.	Dec., 1916	CHARLES TUCKER, Mich.	Jan., 1916
JORIS BROS., Tex.	Dec., 1916	M. KLITGOOD, N. Y.	Jan., 1916
R. CLEMENS, Conn.	Dec., 1916	O. STENNING, S. Dak.	Jan., 1916
SCHREFFLEY & SCHMITT, Pa.	Dec., 1916	IVER JOHNSON ARMS AND CYCLES WORKS, Mass.	Jan., 1916
A. BRAUSER, Ohio	Dec., 1916	FELDMAYER & SCHAAKE, Kan.	Jan., 1916
J. E. BEATTY, Mo.	Dec., 1916	CHAS. WINTER, Cal.	Dec., 1915
GEO. CASSIE, Scotland	Dec., 1916	E. J. BUFE, Ia.	Dec., 1915
JOHN KAIN, Ky.	Dec., 1916	GEO. STYKES, Aus.	Dec., 1915
F. W. HOWELL, Ill.	Dec., 1916	W. PATRICK, N. Y.	Dec., 1915
TOM NOLAN, S. Aus.	Nov., 1916	JAS. A. SHARP, Mass.	Dec., 1915
H. J. FRENCH, N. Z.	Nov., 1916	J. KRAHULEC, Ill.	Dec., 1915
F. N. BROWNING & SON, Ky.	Nov., 1916	P. E. DAHLFURST, Cal.	Dec., 1915
J. MACUAB, Scotland	Nov., 1916	WM. BISHER, Ohio	Dec., 1915
P. GESSEN, Ill.	Nov., 1916	C. A. JERNER, Neb.	Dec., 1915
J. W. GRIBBLE, S. Aus.	Nov., 1916	G. S. FISHER, Neb.	Dec., 1915
W. G. SIM, N. Z.	Nov., 1916	PRINTERS SUPPLY COMPANY, Neb.	Dec., 1915
H. V. RUEHL, Ala.	Nov., 1916	M. KENNEDY, Tasmania	Dec., 1915
G. LINDSBERG, Ind.	Nov., 1916	WILLIAMS & TURNER, W. Va.	Dec., 1915
PITTMAN STELL, N. C.	Nov., 1916	C. J. ASH, Kan.	Dec., 1915
J. S. FINKENBINDER, Ind.	Nov., 1916	F. H. JOSLIN, Mass.	Dec., 1915
R. D. WIXOM, N. Y.	Nov., 1916	C. W. AMES, Mass.	Dec., 1915
E. A. KNAPP, N. Z.	Oct., 1916	C. L. SORENSON, Neb.	Dec., 1915
T. J. HASKIN, N. S. W.	Oct., 1916	E. WILLIAMS, N. Y.	Dec., 1915
LOTHIAN & SKINNER, N. S. W.	Oct., 1916	W. URQUHART, N. Z.	Dec., 1915
W. B. KNOFF, Ala.	Oct., 1916	W. RUPE, Kan.	Dec., 1915
GORHAM BROS., Ia.	Oct., 1916	L. S. KOCHER, Ia.	Dec., 1915
W. H. F. BRAUCH, N. C.	Oct., 1916	P. W. FRASER, N. Z.	Dec., 1915
CLARK OLDS & CO., Neb.	Oct., 1916	J. F. SHIMANEK, Md.	Dec., 1915
IRWIN SCOTT, N. Y.	Oct., 1916	J. MACCLURE & SON, N. Z.	Dec., 1915
C. E. DURHAM, Kan.	Oct., 1916	HUFF & HANSON, Wis.	Nov., 1915
M. RINGO, S. Africa	Oct., 1916	J. P. CARRICK, Ind.	Nov., 1915
W. DELLEY, Queens, Aus.	Oct., 1916	D. CODEBER, Ill.	Nov., 1915
J. J. ILER, N. S. Wales	Sept., 1916	F. S. WOODY, Ia.	Nov., 1915
JAMES POTTINGER & CO., Mo.	Sept., 1916	GEORGE H. ISELEY, Mass.	Nov., 1915
JNO. GOTTINGER, Ia.	Sept., 1916	M. I. HUFF, Mo.	Nov., 1915
GEO. FLECKENSTEIN, Cal.	Sept., 1916	STEPHEN WACHTER, Pa.	Nov., 1915
GEO. HILL, Aus.	Sept., 1916	C. J. WILLARD, Ill.	Nov., 1915
E. C. BEARD, Aus.	Sept., 1916	J. S. LEE, Wash.	Nov., 1915
J. K. GLINICKI, Mich.	Sept., 1916	L. P. MORTENSEN, Mich.	Nov., 1915
OSCAR BURNER, Md.	Sept., 1916	R. L. WHITFIELD, N. S. W.	Nov., 1915
A. J. HAMMOND, Cal.	Sept., 1916	FRED HENKEA, Mich.	Oct., 1915
ROBERT MURRAY, Cal.	Sept., 1916	W. FOULKES, England	Oct., 1915
D. E. WRIGHT, Pa.	Sept., 1916	N. W. HAMMOND, Col.	Oct., 1915
J. S. HASKELL, Col.	Sept., 1916	P. G. DAIRDSON, N. Dak.	Oct., 1915
R. SOMMER, Aus.	Sept., 1916	C. N. MILLS, Cal.	Oct., 1915
J. A. SEQUIN, Can.	Aug., 1916	H. DIER, S. Aus.	Oct., 1915
JAMES CLARKE, Jr., Aus.	Aug., 1916	S. B. GOODSPELL, Conn.	Oct., 1915
DISPATCH FLYD, Ltd., N. Z.	Aug., 1916	D. F. HALLOWELL, Ia.	Oct., 1915
HENRY FISHER, Tas.	July, 1916	A. ROTH, Ill.	Oct., 1915
J. W. FOWLER, N. Z.	July, 1916	C. C. PERRY, Aus.	Oct., 1915
A. C. LODWIG, Cal.	July, 1916	SIDNEY STEVENS IMP. CO., U.	Oct., 1915
A. A. BAHKE, Mich.	July, 1916	W. H. FINDLAY, N. Z.	Oct., 1915
J. K. HANSEN, Aus.	July, 1916	R. F. WATSON, Cal.	Oct., 1915
J. B. BAKER, Ill.	July, 1916	H. R. STONE, Conn.	Oct., 1915
H. M. LARSEN, Wis.	July, 1916	F. TEUBER, Ga.	Oct., 1915
GEO. P. MACINTYRE, Me.	July, 1916	G. A. LINDGREN, Ind.	Sept., 1915
JAS. A. BUCNER, Mich.	July, 1916	J. HELPS, Cal.	Sept., 1915
H. M. FINGAR, N. Y.	July, 1916	ALBERT BALLMER, Cal.	Sept., 1915
L. H. STRANGE, Vict.	July, 1916	J. W. GLEASON, N. W. Ter.	Sept., 1915
P. O'DONNELL, Vict.	July, 1916	SEBASTIAN WAGON CO., N. Y.	Sept., 1915
R. J. HANCOCK, N. Z.	July, 1916	JOHN FINN, Ohio	Sept., 1915
F. G. WILSON, Colo.	July, 1916	J. E. MAYR, Wis.	Sept., 1915
I. H. HALL, Ind.	June, 1916	W. H. MORTON, Mont.	Sept., 1915
F. FULTON, N. S.	June, 1916	H. F. KRAEMER, Ore.	Sept., 1915
J. CHALMERS, S. Africa	June, 1916	J. J. DORAN, Va.	Sept., 1915
G. R. HARRISON, Aus.	June, 1916	W. H. MITCHELL, Mass.	Sept., 1915
J. WAYCIE, S. Africa	June, 1916	S. W. WINCH, Vt.	Sept., 1915
W. VOIGT, S. Africa	June, 1916	ED. HAMMILL, Cal.	Sept., 1915
MARTIN JENSEN, Wis.	June, 1916	R. D. SIMKINS, Pa.	Sept., 1915
CHESTER HUMBERT, Wis.	June, 1916	T. J. REYNOLDS, Pa.	Sept., 1915
LINCOLN UNDERHILL, Cal.	June, 1916	WM. BATES, Tex.	Sept., 1915
M. BROTON, N. Dak.	June, 1916	J. KNIGHT, England	Sept., 1915
HANS ERIKSEN, Ill.	June, 1916	L. F. KUHN, Mexico	Sept., 1915
C. MORRELL, N. Brunswick	June, 1916	A. W. WOOD, W. Va.	Sept., 1915
J. O. CONRAD, Kan.	June, 1916	HUGH L. LYNN, Ky.	Sept., 1915
ADAM SCHMITT, Mich.	June, 1916	R. T. MILLHOUSE, S. Africa	Aug., 1915
I. H. LUNDER, N. Dakota	May, 1916	G. S. DAVIS, N. Y.	Aug., 1915
JAMES SINCLAIR, W. Aus.	May, 1916	H. P. SORENSON, Wis.	Aug., 1915
H. BAKER, Aus.	May, 1916	LEO BRUNS, Ia.	Aug., 1915
E. Q. KREHBIEL, Kan.	May, 1916	M. A. WALSH, Colo.	Aug., 1915
C. H. CAIRNS, N. Y.	May, 1916	LESLIE COOPER, Ohio	Aug., 1915
P. V. JOHNSON, Ohio	May, 1916	ADVANCE BLACKSMITH CO., Mo.	Aug., 1915
F. E. SMITH, Vt.	May, 1916	A. CHARGOS, Queens'd, Aus.	Aug., 1915
C. A. STEBBINS, Kan.	May, 1916	A. M. BYFIELD, W. Aus.	Aug., 1915
SANFORD BAKER, Mo.	May, 1916	C. E. ALLEN, Neb.	Aug., 1915
E. B. ANDERBERG, Ill.	May, 1916	M. J. RODER, Mont.	Aug., 1915
KELLHER BROS., W. Aus.	Apr., 1916	J. E. LYON, Tex.	Aug., 1915
P. A. PETERSON, Ia.	Apr., 1916	F. W. KRENS, Cal.	Aug., 1915
G. F. BOWERS, Okla.	Apr., 1916	J. W. STORMENT, Ill.	Aug., 1915
D. E. McDONALD, Fla.	Apr., 1916	JOS. P. ROTOLINSKI, Mass.	Aug., 1915
JAMES BAXTER, S. Africa	Apr., 1916	H. PEDGON, W. Aus.	July, 1915
E. P. DIGNAN, S. Aus.	Apr., 1916	C. H. PEARCE, Aus.	July, 1915
W. H. WINGET, Vt.	Apr., 1916	JOHN HEHOR, N. Y.	July, 1915
C. SCHMID, Neb.	Mar., 1916	T. O. CHITTENDEN, N. Z.	July, 1915
A. ROCKENSCHEIDT & SON, La.	Mar., 1916	THE GOLDFIELDS DIAMOND DRILLING CO., Aus.	July, 1915
C. H. ALEXANDER, N. Y.	Mar., 1916	J. A. LAWTON & SONS, S. Aus.	July, 1915
A. M. HAREBO, Wis.	Mar., 1916	W. C. JONES, N. C.	July, 1915
GEORGE HOWARD, Kan.	Mar., 1916	J. PICOTTE, Yukon Ter.	July, 1915
G. N. FOLLMAR, Neb.	Mar., 1916	GEORGE M. FERRER, Ut.	July, 1915
W. WILLOUGHBY, Mich.	Mar., 1916	T. S. FINNING, Vic., Aus.	July, 1915
H. HOFMEYER, N. J.	Mar., 1916	R. L. PARKER, Ohio	July, 1915
FRANK L. LOCKE, N. Y.	Mar., 1916	J. MANLY, Aus.	July, 1915
FRANK L. EVARTS, Conn.	Mar., 1916	G. SUNDBERG, Wash.	June, 1915
C. R. WINGET, Vt.	Mar., 1916	I. F. & F. A. STEWART, Ohio	June, 1915
H. & J. CHISHOLM, N. Z.	Mar., 1916	C. F. SEIFFERT, Texas	June, 1915
C. F. MOKENTEN, Aus.	Mar., 1916	S. A. STILLERS, Ohio	June, 1915
H. D. PHILLIPS, S. Aus.	Mar., 1916	E. L. HERRING, Fla.	June, 1915
J. B. FRY, Was.	Mar., 1916	G. R. TWEDDELL, Miss.	June, 1915
L. A. DOWNING, Cal.	Mar., 1916	H. P. HOUGHTON, Ill.	June, 1915
A. A. SCHREIBER, Tex.	Feb., 1916		
J. T. DILLARD, Tex.	Feb., 1916		
F. J. FLESSEL, N. Y.	Feb., 1916		
E. P. JONES, Kan.	Feb., 1916		
E. J. BISHOP, N. Y.	Feb., 1916		

Answers to Questions in September Issue

1. The principle is the well known one that gasoline when mixed with a certain amount of air is highly inflammable, and that when such a mixture is enclosed and ignited it will explode and expand.

2. "Two-cycle engine" means an internal-combustion motor which goes through two distinct movements on each explosion in its cylinder. "Four-cycle engine" means that the motor goes through four distinct movements on each explosion.

3. There is first the suction stroke during which the fuel is drawn into the cylinder. Then there is the compression stroke which compresses the fuel which is in the form of vapor. Next is the power stroke which results when the fuel is ignited and the explosion occurs. Last in the cycle of events is the scavenging stroke which drives the burnt gases out of the cylinder.

4. A heavy wheel called the fly-wheel is fixed to the crankshaft of the engine. This wheel when once started in motion tends to keep on revolving, thus turning the crankshaft which in turn operates the piston by means of the connecting rod. Thus is the piston pushed backward and forward by the impetus given the flywheel by the power stroke.

5. An electric spark is now generally used to fire the charge of fuel.

6. The occurrence or timing of the spark insures the correct running direction of the flywheel and crank.

7. An automatic valve is one which is operated by the suction of the piston. It is sometimes employed as an inlet valve.

8. The mechanically operated valve is one operated by a camshaft or other mechanism operating positively and actuated by the crankshaft.

9. Piston rings, because of their elasticity, take up the wear between the piston and cylinder; they prevent the escape of the gases in the cylinder and insure compression. If the piston were employed without rings, both the piston and cylinder would soon wear, without any provision for taking up such wear.

10. The high heat of the exploding mixture heats the cylinder, piston and valves, and would cause them

to deteriorate rapidly if no means were used to cool them. The heat cannot naturally radiate rapidly enough, because of the quick succession of explosions.

The Blacksmith and His Work in the Middle Ages

HERBERT O'DONNELL

Time is so important a factor with us today, and labor saving devices and appliances for turning out work quickly and cheaply are so essential that, in every development of labor, skill in handwork has declined. Especially is this true of hand-forged artistic ironwork. As a consequence, the utilitarian examples of the present day smith are in sharp contrast with the artistic productions of his ancestors.

The smith of today can buy his iron ready rolled into rods of many different forms and lengths. The old-time blacksmith had to hammer out every section with his own hand. He would cut a piece from his shingled bar from which he would

work, many specimens of which remain objects of interest to this day and serve as types for imitation. The mediaeval blacksmith was an artist. It was his aim to turn out work of great merit, and as a consequence he wrought graceful forgings. The many hinges, gateways, grilles, altar railings and other examples of his work to be seen in museums, especially those of the Old World, are tributes to his skillful craftsmanship.

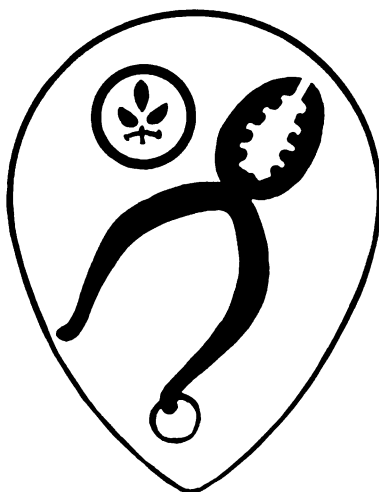
Hinges

Advancing a little beyond the very first products of the smith's forge, such as the ploughshare, the reaping hook, articles of war and hunting and the iron nail, one of the earliest uses of wrought iron was in the making of hinges, bolts and handles on doors. No specimen of old ironwork has been so frequently preserved as the hinge. Being tightly riveted to the wood it was a difficult task to remove them and they were rescued and applied to new doors when old ones decayed.

The earliest form of an iron hinge was a strap crooked at one end into a socket which was fixed to the doorjamb. More advanced styles were adopted as the desire for beauty prevailed, and the hinge was developed, branching out into scrolls with flowered leaves and ornaments, and spreading all over the door. The large ornamental hinges were doubly useful, for aside from serving the purpose as a hinge they helped to hold the panels of the door in position, thus preventing it from warping as well as strengthening it against invasion. Massive ornamental hinges made by mediaeval blacksmiths are still to be seen on the doors of cathedrals in the Old World.

Grilles

Another famous product of the smith of the olden days was the grille. These grilles or screens were erected about the tombs, shrines, altars and choirs in the old cathedrals. As a rule they were of scrollwork and beautifully executed. They were usually formed by the smith taking an iron bar, heating it and then splitting it into various branches, each of which would be twisted in a different way. It was in the making of these grilles that the smith of the Middle Ages displayed his great skill. Some of those who worked at Westminster Abbey are known by name. Master Henry



ARMS OF THE GUILD OF BLACKSMITHS OF FLORENCE. BLACK TONGS ON A WHITE FIELD—A GOLD FLORIN IN ONE CORNER

beat out a rod of the required length or curl a scroll of desired form. Thus the article upon which he worked was fashioned according to the eye and hand of the craftsman, and possessed an individuality. For this reason old ironwork generally commands an interest, and rarely fails to please.

In the Middle Ages, when all the handicrafts flourished to a high degree, the followers of the "honest craft" executed their most beautiful

THE AMERICAN BLACKSMITH

Lewis, 1259, made the ironwork for the tomb of Henry III. The grille on the tomb of Queen Eleanor was made by Thomas de Leighton, in 1294. Quentin Matsys, famous as the "blacksmith of Antwerp," is supposed to have made the ironwork at the tomb of the Duke of Burgundy in Windsor, which is considered the finest example of grillework in England. The grilles made by the blacksmiths of Florence were unexcelled anywhere in the world. Firmness of the iron wire and bars, perfection of hammering, naturalness of floral ornament, neatness of joints and knobs and the high finish and grace of the work are the conspicuous characteristics of Florentine grilles. The Florentine blacksmiths were at the zenith of their success in the sixteenth century. Each workman was an artist able to turn out any design submitted to him, and to create new and beautiful objects whenever summoned to do so.

Armor

Up to the fourteenth century most of the armor was made with a hammer by the blacksmith. It consisted mostly of chain coats, called coats of mail, and the work was a long and tedious task for the armor maker. The fourteenth century witnessed a transformation in armor making; the coats of mail giving way to plate armor, consisting of a set of plates fastened together by links. This was the evolution from mail to plate armor. By the fifteenth century whole suits of armor were almost universal. The smiths of Italy and Germany seem to have excelled at armor making. Filippo Nigroli, John Ambrogio and Hieronimo Spacini, a Milanese, were the most celebrated Italian armorers. Desiderius Kollmann of Augsburg who furnished (among others) to Philip of Spain armor of great beauty, was a famous German armorer. William Pickering and William Austin were English smiths who became well known as armor makers.

Guilds

The blacksmiths had their guilds along with their brother artisans. It is not definitely known at what date the first guild of blacksmiths was established, though the one in Florence was in a flourishing condition as early as the thirteenth century. The oldest statutes of a guild in Paris are those of the can-

dlemakers which go back to 1061. History records guilds of weavers in England as early as 1130, and we find the merchants bribing King John to revoke their charter, and the weavers buying it back again.

The guild system was at the height of its development and power in the fourteenth century. Then no association of artisans could legally

smithy when the guilds were in full swing.

The Smith's Man

Who will be the smith's man?
He that any good can,
To take his cups, or drink his bowls,
Or whisk his beesom o'er the coals?
Or heave the bellows, the first to blow,
And while the iron is hot, strike ho!
Fough—fough—to fough!

The typical craft guild contained



"THE ADORATION OF THE KINGS", PAINTED BY QUENTIN MATSYS, "THE BLACKSMITH OF ANTWERP"

exist without a license from the king, a lord, the mayor or other official in the district in which it proposed to establish itself. The different trades were distinguished by various styles of special dress called liveries and by their banners and arms. They had their own songs and ballads which were rendered on "club nights" and on other festive occasions. Here is one popular with the English

three classes of artisans—masters, journeymen and apprentices—and was so regulated as to provide employment for all its members. Each craft had its own court and there tried all cases arising out of trade dispute. The guild officials supervised the workmanship of the craftsmen, and in this way a very high standard was maintained. Towards the end of the fifteenth century the guilds were becoming associations for the

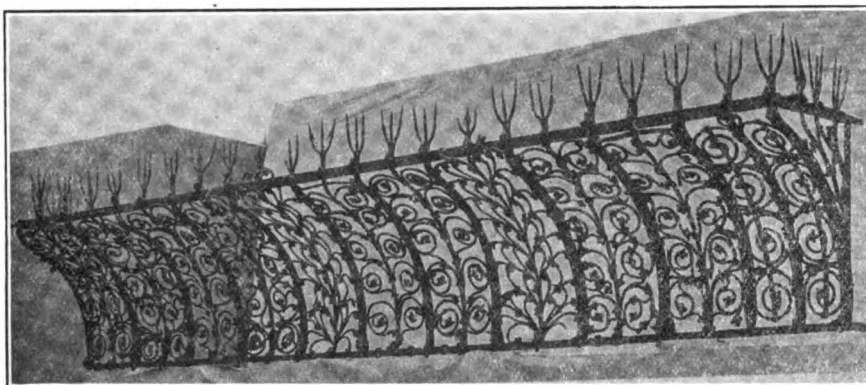
investment of capital. The journeyman was losing his chance of rising to be a master. In some of the guilds a man had to pay a good sum of money before he could be admitted. He had to prove descent from a guild

in his hand. He became Bishop of Worcester and later Archbishop of Canterbury. St. Dunstan died in 988.

Another ecclesiastical blacksmith who attained a high position in the

the Museum of Antwerp. In the Metropolitan Museum of Art in New York are two of his pictures, "The Crown of Thorns" and "The Adoration of the Kings."

Quentin Matsys died at Antwerp and is buried in front of the Cathedral. The immediate spot is marked with the simple inscription "M. Q. M. obiit 1529." The well-cover near the Cathedral at Antwerp is a monument to his skill as an ironworker, and is always known as Quentin Matsys' well.



REPRODUCTION OF THE "ELEANOR GRILLE" IN THE METROPOLITAN MUSEUM OF ART—THE ORIGINAL GRILLE IS IN ENGLAND

member and had to serve seven years' apprenticeship. The number of apprentices finally became rigidly restricted and trade was in the hands of a few. But Henry VIII confiscated the property of almost all the craft guilds in England. In France they were dissolved by law at the beginning of the Revolution.

St. Dunstan

In the Middle Ages the larger monasteries were great industrial centers. An Abbey like St. Edmonds or Glastenbury would have its own smiths, carpenters, masons, millers, etc. Edgar, who reigned in the early part of the ninth century, laid down a law that every priest should learn some handicraft. Perhaps the most conspicuous figure as such was St. Dunstan, who was born in 925 and became a monk at Glastenbury Abbey, where he became especially skillful as a worker in metal. St. Dunstan was a good musician, a great scholar and a man of culture. He was a favorite at Court in the reign of Edmund. There is a legend that Satan by assuming the form of a beautiful girl tempted him as he was working at his forge. The Holy man immediately attacked him with his blacksmith pincers and put him to flight. There is an old rhyme:

"St. Dunstan, so the story goes,
Once pulled the Devil by the nose,
With red hot tongs, which made him
roar,
That he was heard three miles or more".

In old portraits St. Dunstan is represented in ecclesiastical costume, holding a pair of blacksmith's pincers

church and a reputation as a master craftsman was St. Bernward who became Bishop of Hildesheim, a cathedral town of Germany, in 993. He died about 1022, and was canonized by Pope Celestine III in 1194. Bernward was a man with a great love for art. He painted and wrought in metal with greater skill than many a smith whose life was spent at the forge. He cast the bronze gates sixteen feet high for his cathedral in Hildesheim. They are unsurpassed as specimens of early metalwork. The subjects of the bas-reliefs on them, designed and executed by himself, are the first and second Adam. In the Cathedral Square stands his brazen pillar, fourteen feet high, bearing in bas-relief twenty-eight representations of the events of Christ's Life and Passion. The date of this is 1022. In St. Michael's Church, in the same town, is a crucifix twenty inches high, covered with gold plates set with precious stones and ornamented with filigree made by the Bishop.

Matsys

Quentin Matsys, the "Blacksmith of Antwerp," and perhaps the most famous of blacksmiths, is said to have relinquished his work in iron, to become a painter, in order to marry the lady of his choice who refused to become the wife of a craftsman. As an artist he rose to eminence and his pictures are seen in nearly all large European Galleries. His most important work with the brush was an altarpiece in three parts, now in

Some Bonds Which Turned Out Different Than the Owner Expected

ELTON J. BUCKLEY

One day about a month ago a retail merchant came into my office for advice and such comfort as he could get as to his status in a matter in which he had invested nearly a thousand dollars in a promoting company which had just gone into the hands of a receiver. Although the receiver was hardly cold in his seat, the company was busily calling on its deceived stockholders and bondholders to furnish money to extricate it from its difficulties and, to use the language of the soliciting circular, "to protect the investment they already had."

This man several months before had found himself with a few hundred dollars' surplus, which he wanted to invest. Therefore, when a solicitor approached him with the bonds of the promoting company, he was a willing listener, and in the end he bought nearly a thousand dollars' worth. When he bought, he was under the impression that the bonds were regular first mortgage bonds, which, as everybody knows, are a lien upon all the real estate of the company issuing them. As this company owned large tracts of real estate which it has engaged in marketing, a bond such as the merchant thought he was getting would have been a fairly safe investment.

The fact that this investor and thousands more just like him did not know that corporations often issue bonds which are not first mortgage bonds at all, and which give no lien on anything, has led me to write this article in the hope

that the knowledge that it may convey will protect some other business man to whom a similar investment scheme may be offered.

Let me say that nobody, unless he is an experienced investor, should invest money in stocks or bonds of any character until he has had the

tion and which are not a lien and afford no security.

Such a bond when issued by a strong and established company is only a little more valuable as an investment than a promissory note. When issued by the average promoting company they are the flim-

company's promise to pay, backed and guaranteed by a first mortgage on the entire assets of the concern. The bond with its accompanying mortgage is therefore a first lien on everything that the company has and, if the assets are ample, obviously the bondholder is



Apologies to Farm Imp. News

DON'T LET THE PETTY AFFAIRS OF POLITICAL STRIFE DISTURB YOUR BUSINESS

advice of some banker or lawyer, preferably a banker.

When I examined the bonds of the retail merchant I have referred to I found that they were bonds truly enough, but simply that kind of bond usually called debenture bonds, that is, simply bonds which constitute a sort of floating obliga-

tion and which are not a lien and afford no security. The weak point in first mortgage bonds as an investment is that, under the terms of the mortgage, a single bondholder in case a concern defaults on its interest cannot foreclose. Only a majority of the bondholders acting together can foreclose, and this allows self-seeking "bondholders

siest kind of security, and any man is playing heavy chances against himself when he puts his money into them. The difference between a first mortgage bond and a debenture bond, as an investment, in a nutshell is this:—

A first mortgage bond is the

well protected. The weak point in first mortgage bonds as an investment is that, under the terms of the mortgage, a single bondholder in case a concern defaults on its interest cannot foreclose. Only a majority of the bondholders acting together can foreclose, and this allows self-seeking "bondholders

committees" to get in and capture fat fees, cause long delays and finally reorganize the company to their own advantage.

The holder of a debenture bond, however, doesn't have anything like even this security. I have already explained that it is not a lien on anything and there is neither real nor personal profit behind it. With a million dollars' worth of debenture bonds plastered all over its business the company can still sell and dissipate its property as freely as if the debenture bonds were not there.

bonds and \$25,000 worth of debenture bonds. After a more or less fitful existence for a couple of years it went into the hands of a receiver and finally was wound up and its assets distributed. The company owed \$37,000 in ordinary merchandise debts and loans. Its assets brought \$55,000, so that distribution was made in this way: First, the mortgage bonds which were a preferred lien; next the debenture bonds which came after the mortgage bonds, but before the general creditors, and finally the general creditors who only received about 60 per

while others do not. Occasionally, debenture bonds even contain a provision for the protection of the holder; prohibiting the company from issuing other bonds, like mortgage bonds, which will get in ahead of the debentures.

Very few of the type of concerns which offer their stock and bonds to the average business men, however, include any security whatever—their bonds are merely their promise to refund the investors' money.

There may be between these two classes of bonds all the difference between a very good investment



ANY LOVER OF HORSES WOULD ENVY THE DRIVER OF THESE FOUR

Except in one respect a debenture bond is no different from a promissory note, which is of course merely an unsupported and unsecured promise to pay. The one point of difference is that the holders of debenture bonds if the company is wound up and its assets have to be distributed come in ahead of the general creditors—if there is anything to distribute after all the preferred claims have been paid.

To make this plain, take a case which came under my notice not long ago. A small manufacturing company issued \$50,000 worth of stock—\$25,000 of first mortgage

cent of their claims. The stockholders got nothing. Had the assets been \$30,000, the mortgage bondholders would have taken \$25,000 and the remaining \$5,000 would have been distributed among the holders of the \$25,000 debenture bonds.

A debenture bond may have some other form of collateral security behind it—other bonds or mortgages or stock. It may also be backed by property to be acquired by the company in the future, including book accounts. Some companies issuing debenture bonds back them with this kind of security,

and a very bad one; all the difference between having something to show for your money and having nothing. My point is that no ordinary business man without special experience can safeguard himself on these points by himself.

(Copyright by Elton J. Buckley)

Little Suggestions for Increasing Smithshop Business and Profits

L. G. HUTCHINS

The average vehicle shop has one or two old wagons which are loaned



THE FOUR-IN-HAND IS NOW SEEN MORE OFTEN ON THE FARM THAN IN THE CITY

to customers while their vehicles are being repaired. Why not clinch the auto business in your town by a similar stunt? Get an old auto; fix it up so it is presentable (and will go with a reasonable assurance of coming back) and allow your customer to use it while his own machine is being overhauled; and *advertise* the fact.

The "butcher, baker and candlestick maker" all use mechanical window displays, more or less; why not the blacksmith? In other words, the up-to-date merchant uses moving displays in his windows. The blacksmith who has power right in his shop, and could at no extra cost install some simple device in a window, doesn't use any display at all.

If you have a telephone in your shop don't lose sight of its possibilities along trade-boosting lines. A man likes to feel that someone is thinking of him, and it has a good effect on him when you ask him about his mare or bay and inquire about that last set of shoes.

A horseshoer in a booming Illinois town made a big horseshoe—an exact reproduction of the regular-sized shoe but of larger proportions—he wired it on a big piece of white board and had a sign painter letter it with an announcement of a prize contest. He offered one complete shoeing to the horseowner guessing nearest to the exact weight of the shoe; one pair of front shoes

to the one guessing next nearest and a miniature shoe to the man making the poorest guess. The shoe was publicly weighed and the winners given certificates which would entitle them to their prizes.

The work-horse parade in a certain Eastern city was utilized by one bright horseshoer as a most effective means of advertising. This shoer, located in the wholesale district, does a goodly proportion of the heavy shoeing in this town. Receiving permission from those of his customers who were to enter animals in the parade he had neat

cards printed which read—"I was shod by John Smith, Expert Horseshoer, 49 Blank Street." These he hung on his customers' horses. Later, when the prizes were awarded, he advertised the fact that seven of the prize-winning animals were shod at his shop, regularly.

Another believer in advertising, located in a Pennsylvania town, had a number of signs made on wood and painted with weather-resisting colors. These he nailed up at the watering troughs about town, and has since traced several good customers to this simple and economical means of advertising.

If a railroad finds it profitable to reduce the size of the pins used in its offices, why should not the blacksmith find it profitable to measure stock accurately instead of guessing, and usually guessing wrong? The Rock Island Railroad saves \$81 a year by reducing the size of the pins used, by $\frac{1}{16}$ of an inch. That doesn't seem a great deal and neither does the small amounts of stock thrown in the scrap heap when a smith guesses "too much" when cutting stock. But, at the year's end, both amount to enough to buy a new machine or to materially increase the profit side of the ledger.

Horseshoeing Shops in Belgium

Most workshops, especially in the Provinces of Belgium, are primitive, and work is not conducted along scientific lines. To encourage better



ANOTHER FOUR-IN-HAND DOING MORE FOR HOME AND COUNTRY THAN ANY CITY FOUR-IN-HAND EVER DID

work the government has organized in Brussels a horseshoeing school which has so far proven very satisfactory. The professors of this school are paid by the State to give practical lessons for two years to the young horseshoers who come from all parts of Belgium once a week during ten months of the year. Before being admitted to the schools pupils must undergo a preparatory course of instruction which is given in twenty-two Belgium towns. This instruction is given twelve times a year on Sundays. After passing a satisfactory examination the student receives a certificate admitting him to the school in Brussels.

Since the creation of this school, which was in 1902, great improvement has been made in horseshoeing; and this improvement is especially noted in the smaller towns where horseshoeing as an art was practically unknown.

Those attending the horseshoeing school and attending the lectures and demonstrations in the various towns are allowed a reduction of fifty per cent in railroad fares.

The streets and roads of Antwerp and Northern Belgium are paved mainly with Belgium block and uneven cobblestones. This causes far greater wear and tear on the feet of horses than is apparent in the Southern districts where the roads are usually macadamized.

In Ghent is a union known as the "Horseshoers and Blacksmiths' Union." The members of this Union are principally horseshoers, blacksmiths, and other craftsmen who are in touch with the iron and metal

industries. The principal object of this association is to enable its members to purchase their materials and supplies, such as iron, nails, coal and the like in small quantities at wholesale prices. To secure the needed supplies, the members send their orders once a week to the central committee. These orders are then consolidated and the union sends one order for each of the items required to the various sources of supply. When the goods arrive at headquarters each member calls, and he is then furnished with the articles mentioned in his order.

This union has become very influential and the membership is increasing rapidly. The central committee also decides in cases of trouble among workmen and regulates salaries.

Most of the horseshoes used are made to order and to fit the animal presented. The American horseshoe has been tried by some shoers, but they do not favor them, because the shoe does not comply with the peculiar conditions that the hand-made shoe is especially turned to meet. An English rubber shoe is used, but to a limited extent.

In the vicinity of Liege and also in the city itself many American-made farriers' tools are used. These are greatly favored and much preferred to the English and European makes. In Crivegnée, a suburb of Liege, is located the agent of an American maker of farriers' tools, and this probably accounts for the preference given the products of this firm.



Treatment of Unique Steel For Rivet Sets and Cupping Tools

J. C. SCOTT

After the die is machined, heat to a dark cherry red, lay down in some dry spot and let cool. This relieves the dies from all strains and eliminates breakages. After the die is cold, re-heat to the same heat as ordinary carbon steel for the same purpose, cool in water and draw just enough so a good file will take hold.

Treatment For Chisels

Heat same as any carbon steel chisel, only heat Unique Steel back twice as far. Cool in the same manner as a carbon steel chisel is cooled, but do not draw the color below a light straw or copper. In other words, just so it can be filed with a good sharp file.

Tempering Mill Picks

L. G. COLLINS

The article by Mr. Galway in the August paper interested me very much, especially his directions for treating mill picks. I was taught a manner of treatment years ago by an old smith who said that he had been using the method for years and had seldom failed to get the result he was after. I will describe this old smith's process as best I can from the way he used it in the shop.

He procured a barrel such as vinegar is placed in and set it down into the ground near his forge. He then filled the barrel nearly full of clean,



THE PENNSYLVANIA SHOEING AND GENERAL SHOP OF MR. W. B. DAPP

clear well water. Into this water he poured salt until the brine was heavy enough to hold up a potato. Then he took a piece of alum about the size of an egg and after pulverizing it he added it to the brine. Then he took another piece of alum about the same size, broke it up into a half dozen pieces, placed it in a small bag or other piece of cloth and tacked this to the inside of the barrel and at a point about half way down in the brine.

This was the bath used. It was made purposely large on account of the great number of mill picks treated at this shop. And the method of working the picks was just about

plunged into the bath and swung around until cool.

This method, at least when followed by this old expert, produced a hard, tough pick that seemed to meet all requirements. This is, as near as I can remember, just the way in which this old smith treated, it seems to me, thousands of mill picks; though I have seen few treated since working in this old chap's shop.

The Parcel Post Law

What It Is—What It Will Do—The Rates

Parcel post is now a law. It will go into effect January 1, 1913. It

for each additional pound and 35 cents for eleven pounds, which is the limit of weight for a single package. The rate within your own city or town is five cents for the first pound and one cent for each additional pound, or 15 cents for eleven pounds.

Zone number two takes in all towns outside the 50-mile limit and inside the 150-mile mark. The rate for zone two is six cents for the first pound, four cents for each additional pound and 46 cents for eleven pounds.

Zone number three comprises all postoffices outside the 150-mile limit and inside the 300-mile post. The rate in zone three is seven cents for the first pound and five cents for each added pound up to eleven pounds, which limit is 57 cents.

Zone four covers all towns from the 300-mile mark to the 600-mile limit. The rate is eight cents for the first pound, six cents for each additional pound and 68 cents for the maximum weight.

Zone five takes in all towns between the 600 and the 1,000-mile marks. The rate is nine cents for the first pound, seven cents for each added pound up to eleven pounds, which limit of weight is 79 cents.

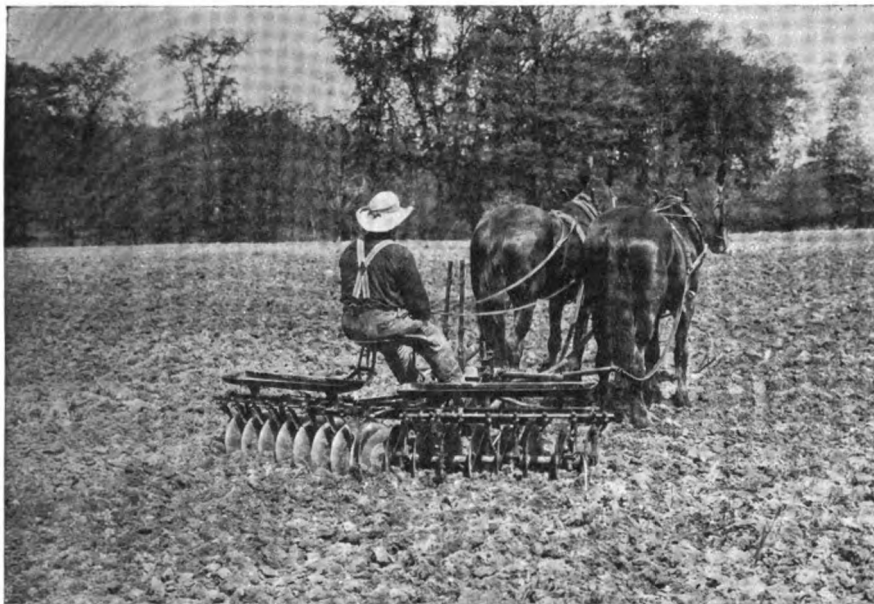
Zone six covers all postoffices outside the 1,000-mile mark and inside the 1,400-mile limit. The rate for zone six is ten cents for the first pound, nine cents for each additional pound and \$1.00 for eleven pounds.

Zone seven takes in all the towns within the 1,400 and the 1,800-mile marks. The rate is eleven cents for the first pound, ten cents for each added pound and \$1.11 for eleven pounds.

Zone eight takes in any postoffice outside the 1,800-mile limit. The rate is twelve cents per pound straight and \$1.32 for eleven pounds.

You will readily see that this parcel post law, with its zone system of rates charged according to the distance to be carried, will enable you to send parcels cheaply, beside the advantage of having parcels delivered and taken right at your own door.

The postal department is now preparing indexes and maps to show at a glance in what postal unit each postoffice is located and the zones in which other postoffices are, with any given office as a standpoint.



THE SMITH ASSISTS THIS FARMER BY SHARPENING HIS DISKS
AND SHOEING HIS HORSES

as original as the method of making the bath.

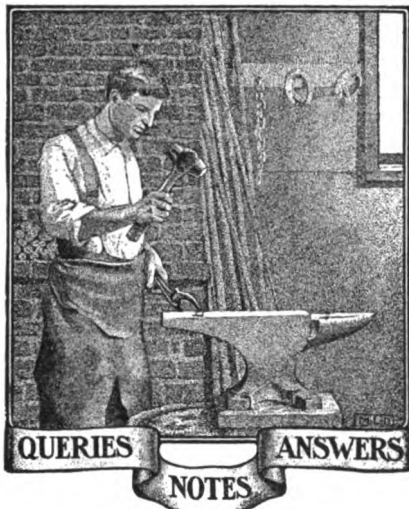
After drawing the pick to shape, the heating and hammering was done very carefully. This smith took three heats for finishing, each heat being lighter than the preceding one. He never hammered on the edge of the pick after hammering on the flat; he never upset the steel; and the last heat he hammered very lightly.

This smith used regular smithing coal for drawing the pick to shape, but charcoal for heating it when finishing.

In hardening, no temper was drawn. He heated slowly, and in heating saw that no scale formed. When at a cherry red the pick was

will enable you to send parcels weighing as much as eleven pounds through the postoffice department. The postoffice department will now accept only parcels weighing up to four pounds, and the rate for four pounds is now \$.64. After December 31st you will be able to send a four-pound parcel to anyone within a radius of fifty miles for \$.14, and to any place over 1,800 miles away for \$.48. While now there is one flat rate on parcels and packages sent by mail, the parcel post law divides the country into eight zones, with a rate for each zone.

For example: Zone number one includes any postoffice from five to fifty miles distant from the center of the postoffice unit in which you reside. The rate for zone number one is five cents for the first pound, three cents



To Blue Steel.—Can someone tell me how to blue steel? I have some of this work to do, but do not know how to go about it.

A. B. READER, Kansas.

In Reply:—Dissolve two parts crystallized chloride of iron; two parts solid chloride of antimony; one part gallic acid in four or five parts of water. Apply this solution with a small sponge and allow metal to dry in the air. Repeat this two or three times, wash with water and then dry. Now rub with boiled linseed oil if you wish to deepen the shade. This should be repeated until the proper result is obtained.

A General Shop of Australia.—My work consists of horseshoeing, making wheels from light to heavy, shrinking tires from six inches down to buggy tires, repairing strippers, winnowers, harvesters, ploughs, mowers, wagon sulkies, drays, harrows, etc. I also make a great many sets of four and five-horse swings or swindle bars and bullock tackling, that is, yoke chains, bows, etc. My shop is about 50 feet long by 32 wide, and is equipped with two forges, two anvils, a D. M. L. No. 4 tire crimper, two drilling machines and many other tools. I also do a great deal of woodwork; such as placing bodies on drays, etc.

F. C. DARBY, New South Wales.

Bending Brass Tubing.—Can you tell me how to bend welded brass case tube so as to have a smooth surface after it has been bent? I tried to bend a piece filled with sand (it being cold at the time), but it puckered up. The pieces I want to bend are 4 feet 6 inches long; some $\frac{3}{4}$ inch and some $\frac{7}{8}$ of an inch in diameter.

E. E. BEARD, Australia.

In Reply:—In filling the tubes with sand they were evidently not properly and tightly packed. Try packing the tubes tightly, ramming the sand down hard. I would suggest bending the tubes between grooved boards or between two wooden wheels, grooved on their edges so that the tube will fit snugly between them.

L. H. M., New Jersey.

Brittle and Inflamed Feet.—I have a horse that has bad feet—brittle and inflamed under the bottom—and he goes lame about once a month. I cannot determine the cause, and I will appreciate it very much if you can give me a remedy for it.

J. D. FERRELL, Florida.

In Reply:—The brittleness is the result of inflammation. The feet have become inflamed because of something affecting the interior structure of the foot. It may be a nail prick or anything of a more or less serious nature. This inflammation has dried the hoof and made it brittle. A good

hoof ointment will assist in restoring the natural moisture of the hoof, but the correct method of treatment is to get at the cause of the inflamed condition. Nothing else will effect a permanent cure.

R. G. H., New York.

Setting Skeins.—Can some Brother tell me how to set skeins so they will not come loose on heavy wagons. I would like to have some pointers on doing this work. Some older man at the trade can no doubt give me the help I want.

C. F. JACKSON, Missouri.

In Reply:—I set skeins and boxes, either old or new, as follows: First, if an old job, remove old skein and scrape the axletree with a knife or rasp until it is perfectly clean. Now mark on the axle the distance to set skein from center to shoulder. Then mix up some white lead with enough linseed oil to make it about the consistency of wagon grease. Spread this over the point of the axle and as far back on the shoulder as needed. Now drive the skein onto the axle until in the proper place. I use the same thing in setting boxes, and experience little or no trouble from loose skeins or boxes.

F. M. K., Iowa.

and drive and clinch your nails carefully. And instead of trying to twist the point of the nail off, cut them with a nailcutter and then clinch them over. I think a good many of the loose shoes are made possible because of the nail twisting in the hoof before twisting off. G. H. GILSON, Pennsylvania.

How to Cure Corns.—I have read "Our Journal" for several years and have read a good many ways of curing a corn on a horse, and do not want to condemn any method, but, as to my experience, will give my brother craftsmen as safe and simple a remedy as can be found on the face of the globe. Cut the corn down as close to the life as possible and put on three to four drops of muriatic acid, and the corn will go if directions are followed. I am also sending you a picture of my shop.

HUBERT G. LEY, Minnesota.

Welding Plow Lays.—Can some Brother who has had some plow-work experience tell me the best way to weld new plow lays? Any help along this line will be gratefully received.

HENRY G. WOOD, Kansas.

In Reply:—My method of welding lays is excellent—I seldom fail by doing the work this way: First make your landside slant



A MINNESOTA SMITHY, RUN BY MR. HUBERT G. LEY

Shoes Come Off Easily.—I have difficulty in making the shoes stay on the feet of some of the animals I shoe. Can some Brother tell me what to do to overcome the difficulty? C. B. SMITH, Pennsylvania.

In Reply:—There are several things at fault when a shoe doesn't stay on the foot for the proper length of time. First, the nailholes should be the right size—they should just fit the nail—there should be no binding, nor should there be a great deal of play or lost motion. Then, too, the nail-hole should have the correct slant in the shoe—it should follow the slope of the foot.

Next, the shoe should fit the foot at every point; fitting full at the quarters. Now drive your nails according to the thickness of the wall of the foot, i. e., if the wall is thick and strong the nail may be started deep and driven low: if the wall is thin the nail will need to be driven shallow and high so as to get a good hold. Clinches may be drawn tightly on heavy, thick-walled feet, but care must be exercised when drawing them up on a light, thin-shelled foot.

The secret of getting the shoe to stay on the foot is to make a proper fit, to make the nailholes of the proper size and slope, use proper sized nails, and to fit the shoe properly to a properly pared foot.

A. E. ADAMSON, New York.

To make a shoe stay on, make a good bearing; a good fit between shoe and foot;

with the frog of the plow, and bevel in the bottom one fourth of an inch deeper than the landside of plow, as the weld takes up about that much and it is always well to have the landside deep enough. Get the bevel on the landside point right with the mouldboard. If you use a share, upset on the outer edge. This must of course be allowed for in the bevel. Now set the point right on the landside. The lay is now fitted—and it is well to remember that a few minutes spent in fitting will save much time and trouble after beginning to weld.

In fitting the lay, rest it well on the heel of the landside and see that it fits close down for about seven inches. Here is where a good clamp comes in very handy. See that the back of the lay has a curve similar to that of the mouldboard. When resting the lay on the landside, give it a twist if it does not fit the back brace on the plow.

Now lay the share on the landside and drive the clamp up within five inches of the heel. Then drive a wedge between the lay and the landside point so as to throw the pressure on the heel.

You are now ready to weld. Heat the heel in a good clean fire, weld at the heel first and work toward the point. If you finish as you go along you will save going back and forth over the lay, and save time and work. Always turn under all you can conveniently spare, and remember that the point is the strength of the lay and don't cut it off. If you will follow these directions,

THE AMERICAN BLACKSMITH

which seem rather complicated but which are really very simple when you are actually doing the work, you will have little trouble with your welds. Use a clean fire, clean borax and mix both liberally with brains.

H. T. LASSEL, Indiana.



MR. J. F. RUDD, AN ARTISTIC YOUNG SMITH

About Cement Floors—We expect to build a new shop, shortly, and would like to get an idea of how the cement floor in the general shop is. A man we have working for us and who has worked in a big railroad shop says the cement floor is very hard on the feet. We expect to do a great deal of the building work ourselves and would like to get some ideas from brother readers.

We have, of course, decided on concrete block walls. In our estimation, concrete is the ideal material for the blacksmith shop.

BARRY & YORK, Indiana.

In Reply—I would advise your inquirers to use the cement floor by all means. We have one here, and while at first it did seem to affect the feet of the men no one of the men would go back to the old, dirty, knotty wood floor. There is no danger of having a horse break his leg on the cement floor, because if it is properly made it won't have any holes in it. Our floor is cut up into small blocks in the shoeing department and about the forges and other sections it is laid off into 3-foot squares.

F. H. B., New York.

The cement floor is by far the better material for the smith shop. We laid our cement floor about a year ago. Our shop had only been built a few years and we were getting tired of continually repairing the wood floor. So we took it up. We hired a man who worked for a contractor and with his help and direction we put down first one half and then the other half of the floor. We now have a warm, dry floor, smooth and even and, best of all, we haven't had to do a bit of repairing on it since its been down. And that is an impossibility with a wood floor if you want to prevent accidents. We also threw out the old wooden anvil blocks and replaced them with blocks of concrete, fashioned

very much on the concrete block illustrated in "Our Journal" several years ago. These blocks are holding out very well.

W. H. GIBNEY, Ohio.

A mixture of two parts cement, five parts sharp sand and seven parts broken brick or stone should prove a good foundation for a smith-shop floor. This foundation should be about five inches thick and well tamped. And if the ground upon which it is to be laid is in any measure loose, this foundation had best be laid upon a well pounded bed of cinders or similar material. After the cement, sand, and broken-stone mixture, a top dressing of three parts sand to one part cement should be applied. This may be either smoothed, roughed or smoothed and blocked.

L. H. E., New York.

A Bright Young Smith of West Virginia.—As I am deeply interested in my work I look for my copy of THE AMERICAN BLACKSMITH every month. I would not try to get along without it.

Most of the smiths in these West Virginia coal districts receive small pay and have to work early and late. The prices for the necessities of life are exorbitant. This field is running over with botches and "Tom Tardys," who cut prices continually. What we need is organization. I would make a change if I could secure a good shop, well equipped, or if there is a brother smith who wants to employ a young smith. I can give references at any time.

In the photograph I am sending I am holding two pieces of work of my own design. In my right hand is an ornamental frame made of different sized stock with two roses made of soft steel. The leaves are made of 1/4-inch iron, one at a time, bunched together and welded and then welded to the rose stem. The top pieces of frame are beaded. I made a tool as explained by Mr. Hillyer.

In my left hand is a rose and bud. The big main stem is on a stand that resembles roots. I cut thorns all over it with a small diamond-point chisel. This class of work requires very close attention, but when finished is something to be proud of.

J. F. RUDD, West Virginia.

EDITOR'S NOTE:—Any reader wishing to communicate with Mr. Rudd can secure his address from the Editor.

A General Shop of Western Canada.—I started here in April, 1911, and have worked up a pretty good business. The engraving shows my shop. I do all kinds of repair work, both in wood and iron, beside

their discs as long as they will go into the ground and then they buy new ones. I think, however, I will be able to work up a considerable trade in sharpening. I would like to know what is considered a fair price to charge for sharpening discs. There is one man here from the "States" who tells me that he paid 75 cents per set, but I think this must be a mistake. I have looked through a number of back copies of THE AMERICAN BLACKSMITH and as far as I can see they charge 25 cents per disc. Will some readers kindly tell me what they charge? I have a Giant Wonder machine which does splendid work, but the use of power would increase its efficiency still more.

H. B. FARTHING, Saskatchewan.

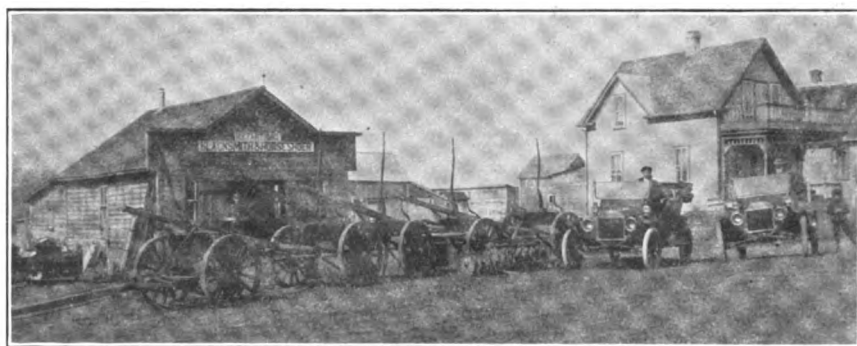
Circles, Advertisements, Answers to Questions.—I see some brother smith asks for a rule to make circles. If he will get out his July number of last year he will find it all worked out for him very plainly in four different ways. If he follows them he cannot go wrong. Any one of the rules will do the job. I, myself, prefer the 3.1416 rule, as I think it the easiest and quickest. I usually pass my journals along to some of the other boys, but the July number of 1911 has such a lot of good points in it that I kept it handy all the time.

I suppose advertisers like to know if their advertisements are read. I will tell of a recent experience. A smith here was moving his shop to a new location. When about to pull up an old fashioned fire and move that into the new place I got out my latest copy of "Our Journal" and showed up those electric down-draft forges. Finally he was persuaded that it would cost less to buy a new forge than to try to move the old one. And the man who is using the forge is more than pleased with its work. Two more fires are to be set up shortly, and it is most likely that they will be of the same style as the first one.

I am well pleased with the questions, but would like to see the answers in the same issue. It is quite a wait from one month to another, and I do not always have the previous issue on hand. I would also like to see more of the queries answered by the brothers—but I suppose I might apply some of that wish to myself.

H. N. POPE, Connecticut.

EDITOR'S NOTE:—A letter from an old friend is like a beam of sunshine after a heavy shower. We hope Mr. Pope will now find time to keep up the good work of sending in a good warm beam of sunshine every month.



THE CANADIAN GENERAL SHOP OF MR. H. B. FARTHING IN SASKATCHEWAN

horseshoeing and motor repairing. The only drawback here is that there is not much to do in winter. I intend to install power as soon as financial conditions permit. I just purchased a disc sharpener, but have not had much sharpening as yet, as it is a new thing here. The farmers seem to use

Mr. Pope's remarks concerning circles and the July issue of 1911 just emphasize the need and importance of preserving back issues, and of glancing through them when in need of information on any point connected with smithwork. Most of the questions asked are answered in back numbers,

THE AMERICAN BLACKSMITH

and if readers would get into the habit of using their files of back issues they would find them a continual help in their work.

The little incident with reference to advertising is interesting. It shows how important the reading of the advertising section really is. If you don't read the advertisements you are losing money in advertising that costs you nothing.

We have already stated elsewhere that the Queries, Answers, Notes department is being made many times more valuable by answering all possible queries the same month. We want every reader to feel free to use this feature of "Our Journal." We want you to ask as many questions as are necessary—don't be afraid to ask too many. And we will endeavor to answer your questions immediately—not three or four months after you ask them—but in the same issue in which your question appears. This need not, of course, prevent any of "Our Folks" from giving their ideas and opinions on any of the questions asked. We hope Mr. Pope and other well-informed smiths will bear the last sentence of Mr. Pope's letter in mind.

Interesting Notes from New Zealand.—Our association is delighted with the firm

brothers in other parts of the world what we are doing in New Zealand.

J. W. BRAYSHAW, Secretary
Master Farriers' & Blacksmiths'
Association of Taranaki.

Price List of Taranaki Association, New Zealand.

PONIES		Cash	Booked
		s. d.	s. d.
All ponies up to nine inches..		5	5 6
Removes.....		2	6 3 0
Slippers.....		3	0 3 6
HACKS		Cash	Booked
		s. d.	s. d.
Shoes up to 13 inches.....		5	6 6 0
Two shoes.....		3	0
Removes.....		3	0 3 6
Slippers.....		3	6 4 0
HALF DRAUGHTS		Cash	Booked
		s. d.	s. d.
Plain shoes to 15 inches.....		6	0 6 6
Removes.....		3	6 4 0
Slippers.....		4	0 4 6
DRAUGHTS		Cash	Booked
		s. d.	s. d.
All plain shoes over 15 inches		7	0 7 6
With heels.....		7	6 8 0
With toes.....		8	6 9 0
Removes.....		4	0 4 6
Slippers.....		4	6 5 0
Toes, 3d. each shoe extra; heels, 3d. per pair extra			

Cash Booked
s. d. s. d.

Toe weights and plain hind shoes..... 8 0 8 6
Side weights, per pair..... 5 0 5 6

STALLIONS IN SEASON

Light stallions..... 9 0
Heavy stallions..... 16 0
Season opens Aug. 1st, closes December 31st.
Two and a half per cent discount allowed off for prompt monthly payments.

The New Zealand Shoeing Smiths' Bill.

Here are a few extracts of the shoeing smiths' bill as amended by the New Zealand House of Representatives and by the Taranaki Farriers' and Blacksmiths' Association:

"After a date to be named, no person shall carry on the business of a shoeing smith unless he—

"Is registered as a shoeing smith under this Act, or

"Is the employer or partner of a person who is so registered.

"Fine for breach of this Act to be 20s. (\$4.87) per day.

"Every person shall be entitled to be registered under this Act who satisfies the registrar that at the time of the passing of this Act he had either:

"Worked as a shoeing smith, or

"Served for a period of not less than five years as an apprentice or assistant of a shoeing smith.

"Every person shall be entitled to be registered under this Act, who:

"Serves for five years as an apprentice or assistant to a shoeing smith and passes the examination prescribed by this Act; to consist of:

"A practical test of the candidate's efficiency in making horseshoes and shoeing horses;

"A written or oral examination in the anatomy and physiology of the horse's foot,

"And in such other subjects pertaining or relating to the trade of a shoeing smith, as prescribed by regulations made under the authority of this Act

"The Governor may appoint all officials and prescribe all regulations dealing with the working details of this Act.

"Nothing contained in this Act shall apply to any person shoeing his own horses."

An Electrically Equipped Shop.—I have been a subscriber to your valuable paper for several years and think it the best that I have ever read. I consider it very helpful and instructive, and think the blacksmith who does not subscribe to it is doing himself an injustice. I believe that when a blacksmith once becomes a subscriber he will always remain one. It is with much pleasure that I highly recommend "Our Journal," and I would like to know that every blacksmith was a reader.

I have been located in this city for the past ten years as a blacksmith and wheelwright, and I am proud to say that each succeeding year has proved more prosperous. I have made many improvements in the meantime. I have been using an electric blower for the past three years, and in the last three months I have installed a new line of machinery, consisting of a rip-saw, a bandsaw, a drill, a planer and an emery wheel, all of which are run by electricity. Since equipping my shop with the above I have realized a great saving in both time and money.

I am sending a photo of myself and one of my helpers. The horseshoes shown in the pile have been pulled off in the last two years. J. D. FERRELL, Florida



A BIG PILE OF SHOES REMOVED IN THE SHOP OF MR. J. D. FERRELL WHO STANDS AT THE RIGHT

attitude you take in persistently advocating that if a tradesman wants to run a successful business he must first find the cost of production and then add the lowest profit he will work for. He then has an irreducible price. And the prices of other tradesmen are left out of the question. Our executive committee urge all smiths to subscribe to and read the trade papers that battle for the advancement of the trade.

I am sending you our price list, which you will note is divided into a cash and credit list. I am also sending you extracts from the shoeing smith's bill. These will no doubt be of considerable interest to readers of "Our Journal" and will show our

RACE HORSES AND TROTTERS

	Cash	Booked
	s. d.	s. d.
Race horses.....	6	0 6 6
Removes.....	3	0 3 6
Slippers.....	3	6 4 0
Racing plates supplied and nailed on.....	12	6 13 0
Racing plates supplied, not put on.....	10	0 10 6
Nailing on racing plates.....	5	0 5 6
Racing tip supplied and put on.....	10	0 10 6
Racing tips supplied, not put on.....	8	0 8 6
Toe weights for trotters, per pair.....	5	0 5 6

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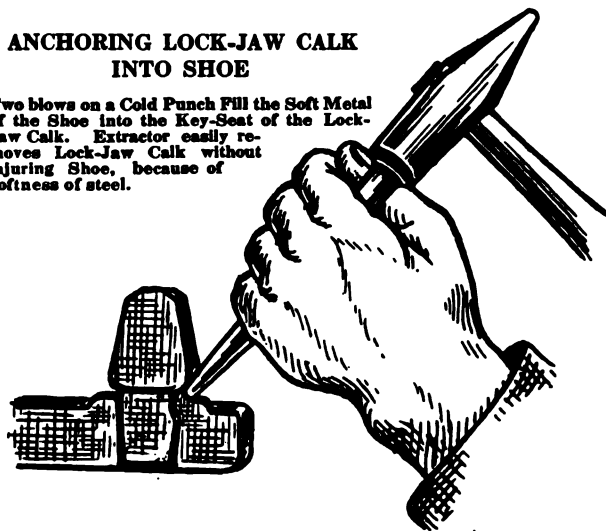
See the Key Seat.
Sharp Lock-Jaw Calk—Back View.



See the Key-Seat.
Dull Lock-Jaw Calk—Back View.

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Two blows on a Cold Punch Fill the Soft Metal of the Shoe into the Key-Seat of the Lock-Jaw Calk. Extractor easily removes Lock-Jaw Calk without injuring Shoe, because of softness of steel.



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Write us for their names and opinions, and if they do not convince you that **KRAKNO** will do all and more than we claim, then try **KRAKNO** for absolute, final proof.

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AUTOMOBILE cylinders rebored, pistons and rings fitted, \$8.00 to \$12.00 per cylinder. Cranks, connecting rods, crank cases, cut gears, in chrome nickel steel, brass, fibre, etc., duplicated like new. Send old parts to go by. Also build power tapping and threading machines for horse shoes and bolts.
MCCADDEN MACHINE WORKS, St. Cloud, Minn.

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C. X. STOKES, Mohawk, Fla.

CASH FOR YOUR BUSINESS OR REAL ESTATE.—I bring buyer and seller together. No matter where located, if you want to buy or sell, address,
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1219 Adams Express Building, Chicago, Ill.

FOR SALE.—Blacksmith and woodwork shop. Fine location.
A. W. NEFF, Mt. Morris, Ill.

WANTED.—To buy a good shop, or would rent or work by the day in some good town in California or Southern Oregon. Can give reference.
G. N. S. Care of American Blacksmith.

FOR SALE or trade my interest in good paying blacksmith business. Address,
Box 255, Henton, Caddo Co., Okla.

WANTED.—General blacksmith and horseshoer, good wages, steady job. Married man preferred. Address F. W., care of American Blacksmith Co.

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Many blacksmiths are assembling their own automobiles. I make a specialty of new 25-30 and 35-40 H. P., four cylinder, four cycle auto engines with magneto and coil. Prices right.
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L. C., Care of The American Blacksmith.

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FOR SALE.—Machinery. 24" Pony Planer \$75; Variety Woodworker \$100; 10" Jointer \$25; Single Spindle shaper \$25.
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P. O. Box 974, BUFFALO, N. Y., U.S.A.

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Our customers say Twentieth Century Shafts "are the best braced shafts"; "the best and neatest looking shafts on the market"; "buyers are demanding them on their orders"; "never handled anything giving such universal satisfaction"; and a great deal more shown in fac-simile reproductions of their original letters in a little book called

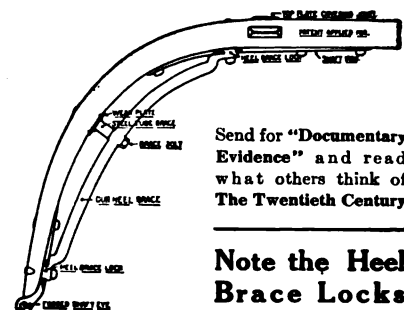
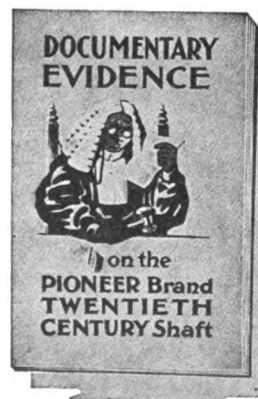
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We use only drop forgings and steel stampings in the construction of Twentieth Century Shafts. They are made of the best hickory we can procure; air seasoned a year's supply in advance.

This material, combined with scientific design and careful workmanship, has won for Twentieth Century Shafts the confidence of the trade. Study the diagram and see how "The Twentieth Century" is lock-braced.

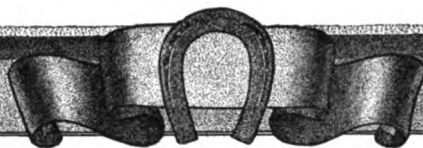
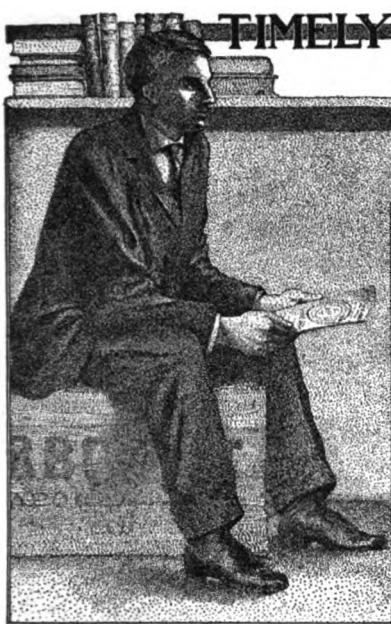
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Bert Hillyer, - - - - George Cormack, Jr.

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170 Miles Away

Down in South Africa, near the Hartbeest River which flows into the Orange River, is a smith-shop about forty feet long and less than half as many feet wide. Inside the door of that shop you will find a lathe, a modern drill and a full line of smith-shop tools. And if you look in at the door during working hours you'll see four men at work, not counting the boss. If you ask the proprietor of that shop, away down there in Cape of Good Hope, if he reads THE AMERICAN BLACKSMITH he'll say: "Yes—and I like 'Our Journal'—it keeps me up to date."

And that shop near the Hartbeest River is 170 miles from the nearest railroad.

A World Famous Blacksmith

A recent morning's mail with its letters from England, Ireland, Scotland, Wales; from Australia, Tasmania, New Zealand; from Africa, the Philippines and South America brought us to a realization of the fact that THE AMERICAN BLACKSMITH is A World Famous Blacksmith. Here are Europe, Asia, Africa, Oceanica and South America looking toward THE AMERICAN BLACKSMITH for enlightenment; looking up to THE AMERICAN BLACKSMITH for his ideas, his examples and for better methods. As Mr. Henry Young of Johannesburg, South Africa, says:

"THE AMERICAN BLACKSMITH should be studied by every pushing, up-to-date smith and vehicle builder."

As Mr. Stephen Cochrane of Sheffield, England, says:

"THE AMERICAN BLACKSMITH is educational and a help that no smith can do without."

As Mr. Geo. Mann of Glen Innes, Australia, says:

"We must thank THE AMERICAN BLACKSMITH for a great deal of information."

And so we might continue with letter after letter. These express by no means the strongest sentiments; they are simply taken at random from the pile. But they express simply and easily the important place held by THE AMERICAN BLACKSMITH in the smithing interests not only of the United States but of the world. It shows that THE AMERICAN BLACKSMITH is doing good work not only for the American blacksmith but for the blacksmiths of all countries.

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The Leading Article

To those of our readers who are interested in casehardening (and what smith is not, in these days of the steel age?) the leading article in this issue of "Our Journal" will be of vital interest and value.

Mr. John Jernberg, who is Instructor in the Forge Department of the Washburn Shops of the Worcester Polytechnic Institute, is pursuing these investigations on casehardening with Messrs. Hogan and Greene. All of the work is carefully done; the materials used being analyzed and careful records kept of the heats.

In these investigations nothing but bone was used as a packing material. A succeeding series of tests will be with the different casehardening materials.

These reports of careful tests and investigations in the field of casehardening should be of great value to the heads of hardening plants and to the men upon whom depends the success or failure of the hardening operations.

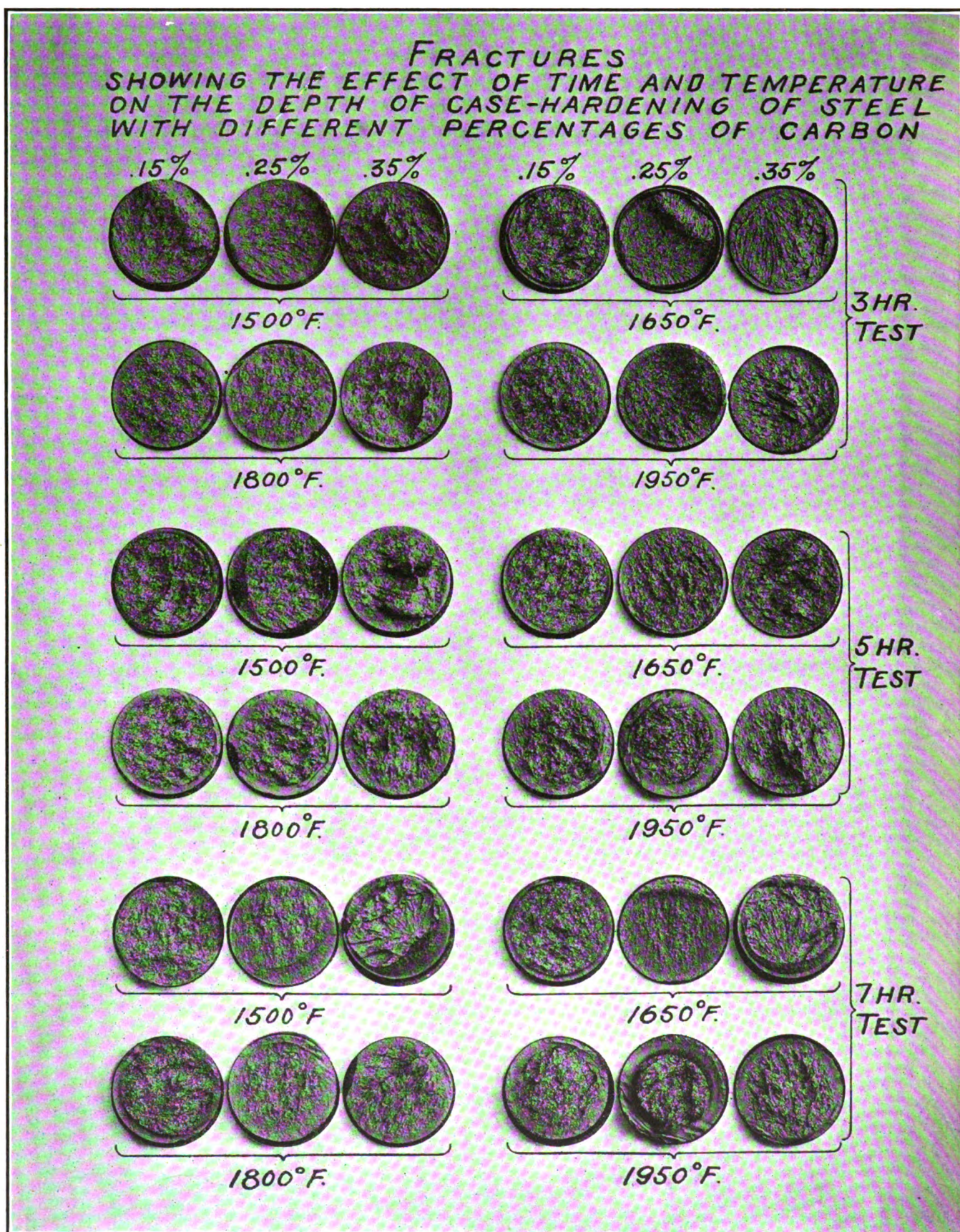
Making Advertising Pay You

If you are not reading the advertising pages you are losing money on advertising that costs you nothing. Here's what a New York State reader says about the advertising section of "Our Journal":

"I would as soon miss reading and studying the ad pages of the paper, after studying the reading section, as I would pass up the dessert after dinner. I find that the advertising fits right into and backs up the reading section. There's not an issue put into my file that doesn't persuade me to write to one or more advertisers. The literature I get enables me to keep up with progress and to get tools and machines that keep my shop up to date. I make the advertising pages pay me, by answering the ads."

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THE TEST PIECES WERE BROKEN TO SHOW THE DEPTH OF THE HARDENED CASE AND THE GRAIN OF THE METAL

The Process of Case-hardening Steel*

What It Is, Equipment Used, Methods Followed and Results Obtained

JERNBERG, HOGAN AND GREENE

THE process of casehardening is founded upon the fact that when iron or steel is heated up

to and beyond a certain temperature in contact with carbonaceous matter the iron or steel absorbs or combines with such a proportion of the carbon as to convert it from a mild steel or a steel of soft character into that of a hard one. It is, in other words, a stopping short of the old method of cementation when the action has only taken place upon the outer portion of the section of steel or bars which are being acted upon.

The term "casehardening" naturally implies the hardening of the skin of an article, and in order to fully understand the process and its object we must briefly consider the facts and laws upon which it is founded.

Carbon has a very great affinity for iron and combines with it at all temperatures above a faint red heat. Steel therefore consists of iron with carbon; carbon being present in a greater or less percentage according as the nature and properties of the particular steel require. The proportion of the carbon content depends of course to a great extent on the purpose for which the steel is required, and its percentage is to a large extent definitely governed by definite laws—the laws of chemical combination. When iron has absorbed in round numbers 90% carbon,

that iron is then known as saturated steel, which means that the percentage of carbon relatively to the percentage of iron has made a definite chemical compound, Fe_3C , the carbide of iron. The prevailing opinions of metallurgists appears to be that the carbon is not absorbed direct in the body of the iron, but that a reaction takes place, and that within the vessel in which the operation is performed there is a certain amount of enclosed air or oxygen. This enclosed oxygen, when the carbonaceous matter has reached a certain temperature, combines with the carbon and forms the gas CO , carbon monoxide, and from this CO the iron draws away the carbon, liberating the oxygen, which again in its turn combines with another portion of the carbonaceous matter, forming CO , and so the process goes on. This is not a generally accepted theory, but is one which is held by a large number of scientists who have made these matters their special study.

In most cases the object of casehardening is to get a hard surface to resist wear; wear is produced by pressure, and to resist this pressure, strength is required; therefore, for most work, such as crankshafts, ball-races, gears, etc., mechanical strength is as necessary as a hard surface; for this reason the steel employed should be very low in carbon, in order to provide the necessary toughness. The case on a piece of work should be of at least 90% carbon, otherwise it will not harden "glass hard," and if the packing material will not give a case of this quality it is of little value.

Casehardening is by no means a modern process, but the scarcity of data regarding the many variable elements led us to make this scientific investigation. The field of a study of this nature is almost exhaustive; the results being governed by five factors, namely: First, the nature of the steel; second, the nature of the carbonizing material; third, the temperature of the carbonizing furnace; fourth, the time the piece



FIG. 1—THE FURNACE USED IN THESE EXPERIMENTS

is submitted to the carbonizing process and, fifth, the heat treatment which follows carbonizing.

Outline

From the five variables present in the casehardening process we have selected three: The nature of the steel in our case being restricted to the carbon content, time and temperature.

*See "The Leading Article," under "Timely Talks with Our Subscribers."

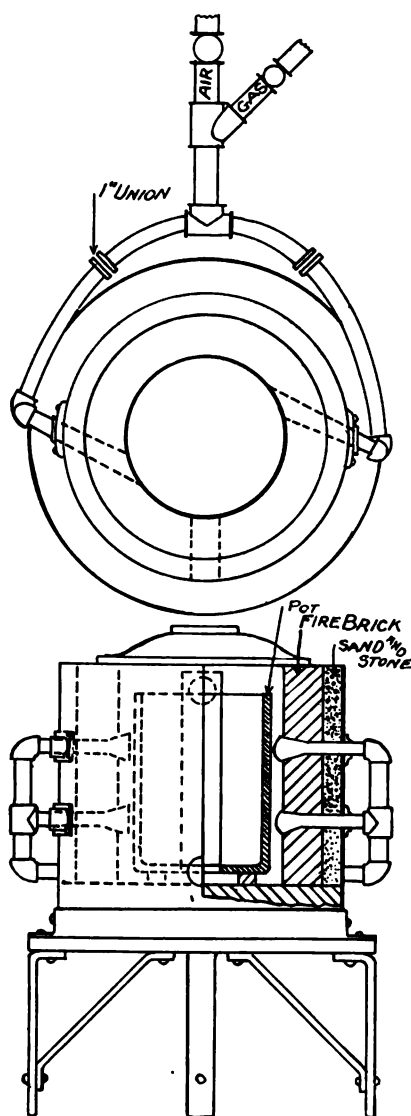


FIG. 2—DETAILS OF THE HEATING FURNACE

Generally speaking, the lowest carbon steel on the market runs about 15%, and in order to conform with practical conditions we selected 15% carbon as our lowest limit. Usually, steel of higher carbon content than 35 or 40 point would not be used, and inasmuch as the time allowed would not permit us to cover a wider range we chose 35% as the upper limit. For the purpose of determining an intermediate point between these limits we took a steel of 25% carbon. This steel was furnished us by Pratt & Inman in $\frac{7}{8}$ -inch round bars, and before applying them to any test a complete analysis of each bar was made.

We arbitrarily selected three periods of time, three, five and seven hours in duration for each change of carbon and temperature, the length of the period being reckoned from the time the pot became heated

through and up to the temperature of each respective test.

From the few available statistics and from practice the best casehardening temperature seems to be between 1500° F. and 1800° F., therefore it was our idea to take this temperature as the middle point of our range. We also assumed that below 1500° F. little casehardening would occur, and that above 2000° F. it would be impracticable to use a cast-iron pot; therefore these considerations led us to adopt 1500° F. for the lower limit and 1950° F. for the upper limit with 1600° F. and 1800° F. as intermediate temperatures.

This combination of three different percentages of carbon, three lengths of time and four different temperatures gave us thirty-six separate conditions of casehardening. To maintain these conditions with the minimum number of heats, the hardening pot contained the three different steels, and for each temperature the tests were run for the various lengths of time.

Practice favors ground bone as a packing material, and as there was plenty of this substance at hand we used this as our carbonizing medium.

What we were to determine was the depth of effective hardness, regardless of the other qualities of the treated steel, and our method for obtaining this depth is described below.

The Furnace

The large circular gas furnace which was formerly used for cyanide hardening in the heat-treating room of the Washburn Shops was selected as being best adapted for our purpose. The details of this furnace are shown in Fig. 2. It is provided with two tuyeres on each side, set at such an angle that the impinging flame from each tuyere traversed the inner lining of the furnace in a circular path. The photograph, Fig. 1, shows the external appearance of the furnace with the cover and pyrometer in place.

The Heating Pot

Fig. 3 shows the final design of the heating pot. It was made of cast iron $\frac{1}{2}$ inch in thickness and rested on three firebrick blocks which brought the bottom of the pot about $1\frac{1}{2}$ inch from the furnace bottom.

The first pot experimented with had the same general dimensions as

that of Fig. 3, but instead of resting upon the bottom of the furnace it was supported from the top by means of a large flange which was made part of the pot casting.

Since this section has to do with the apparatus used, the method of selecting this part of the apparatus might well be supplied here. A trial heat of the first pot was made and it proved very unsatisfactory. On account of the pot not being totally surrounded by the flame, the heat from the top was conducted into the air, and the pot was heated through only at the lower part. To overcome this difficulty the flange was cut off and the pot set down into the furnace on the three firebricks. A large cast-iron cover for the furnace was made which provided a chamber above the pot which was completely surrounded by the flame.

To determine the length of time for the pot to be heated through, several $\frac{1}{8}$ -inch holes were drilled in the cover, and wires inserted down through the packing material to the bottom. At different intervals of time these wires were withdrawn, from the outside to the center successively, and gave an indication of the heat at these points. When the wires near the center showed a uniform redness we concluded that the heat was uniform throughout.

The time required as shown by this test was about three hours. We further decided that inasmuch as the center of the packing material was not in use we might cut out this section and by inserting a pipe open to the flame at the bottom increase



FIG. 3—THE HEATING POT SEALED AND READY FOR THE FURNACE

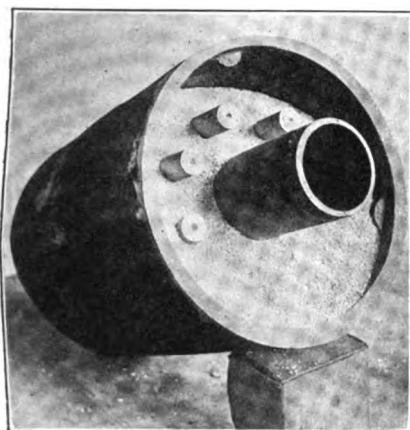


FIG. 4—HOW THE TEST PIECES WERE PACKED

the heating surface in contact with the packing material.

A 2½-inch pipe was selected for this purpose and turned down to form a shoulder; the bottom of the pot was bored out to receive the turned down section, and after being shrunk in position the outside of the pipe was beaded over similar to a boiler tube. A test for heating through was made, and with this improvement the time was reduced from three to less than two hours.

The Pyrometer

It was desirable to keep the temperature as constant as possible at the heats already decided upon, and in order to do this a Bristol Indicating Pyrometer was used. This consists of a thermo-couple connected with a galvanometer calibrated to read in degrees Fahrenheit up to 2200.

The instrument had already been in use, and to roughly check its accuracy we took a small sand crucible and filled it with granulated salt; this we heated in the furnace until the salt melted, and inserted the fire-end of the pyrometer therein. The melted salt being at a higher temperature than its fusing point we allowed it to cool until it was solidifying, and read the pyrometer scale. Salt melts at 1675° F. and we found the pyrometer to be accurate within 10 deg. or 6%. As great difficulty was experienced in keeping the furnace at a constant temperature this error was considered negligible.

Methods and Results

The test pieces already having been cut to 10-inch lengths and turned down to .840-inch were packed in the pot as shown in Figs. 4 and 5. As can be seen from this packing arrangement every relative part of

each piece received the same treatment. After the steel was packed in this manner the cover was put on and sealed with fireclay. Fig. 3 shows the pot complete ready to be placed in the furnace. The thread on the upper end of the pipe was for screwing on a tee in order to facilitate handling the pot, and the handle attached to the cover was for removing it after each test.

The pyrometer was inserted through a hole in the furnace cover between the pot and the furnace wall directly behind one of the tuyeres. The furnace was lighted and run to its full capacity until the test temperature was reached when the mixture of gas and air was throttled down, keeping the temperature constant.

The period for the test was, as has been described, three, five and seven hours, with an additional two hours for the pot to heat through, making the total periods five, seven and nine hours.

Little difficulty was experienced at the low temperatures; one pot scaled badly and a new one was made. However, at the temperature of 1950° F., the cast-iron pot melted as shown by Fig. 6. Fortunately, a graphite crucible, Fig. 7, of about the same dimensions of the pot was at hand and this we used for all the tests at the highest temperature.

The furnace with its contents was allowed to cool after each test.

Testing the Depth of Hardness

There are two methods of testing the depth of hardness—one using nitric acid on the casehardened cross section, the same being ground, a black ring appearing at the base of

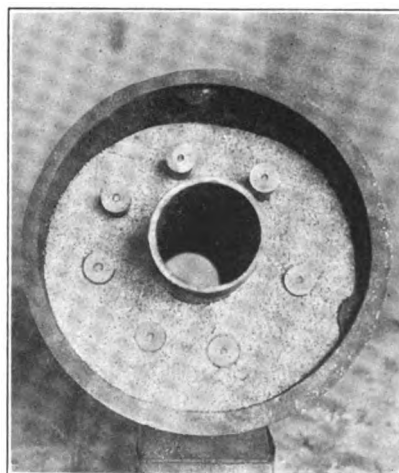


FIG. 5—ANOTHER VIEW SHOWING HOW THE PIECES WERE PACKED

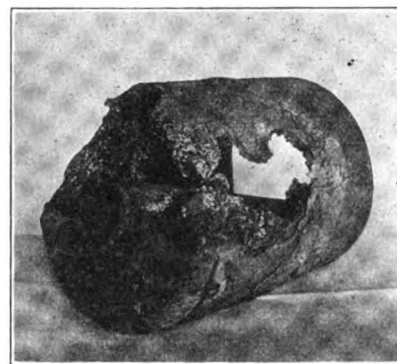


FIG. 6—THE CAST-IRON POT MELTED AT 1950 DEGREES

the case; the other method is by filing the core from the inside until the case is reached. We chose the latter method as being more accurate, because in this way all the pieces could be filed to a definite hardness which could be determined by a standard made of 90-point carbon steel so tempered that a smooth file would just "touch" it.

The thirty-six pieces were selected, and the first operation was to saw them in half; the idea being to test the middle section. These pieces were now put in the milling machine and milled as shown at the left side of Fig. 8, with a ¾-inch thick tongue, ⅛-inch deep.

The next operation was to harden the test specimens in a lead bath at 1450° F., after this the core was milled out as near as possible to the case as shown at the right side of Fig. 8.

Inasmuch as a personal element enters into the filing for determining where the hardness commences it was decided that one of the investigators should file one side and the other the remaining side, thus giving a check on each other. How closely they agreed is shown by the tabulated values. The filing completed, each side was calipered and the mean results used in plotting the curves.

The Curves

The following curves have been plotted from the tabulated average values; curves showing the relation between the depth of effective hardness and temperature for periods of three, five and seven hours respectively. It is seen that with the three-hour test the 15-pt. and 25-pt. curves are very close together; the 25-point curve being a little steeper, however; the 35-pt. curve shows a much greater depth for all temperatures above 1500°

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F. These curves approximate straight lines, although the points show variations.

The curves of depth of hardness against temperature for five hours show a regular curve; the 15-pt. and 25-pt. curves being almost coincident; the 35-pt. curve being nearly parallel to the others, but showing a greater depth throughout.

The three curves for the seven-hour test are much similar to the five-hour test, but are steeper; the 25-pt. steel taking the deepest case; the 35-pt. curve falling below the others.

It will be seen that the rate of penetration increases very rapidly with the higher temperatures, and the points with but few exceptions form definite curves.

Curves have been plotted showing the relation between depth of effective hardness and time for the different temperatures. At 1500° F. and 1600° F. the curves approximate straight lines with very little slope; showing that at low temperatures the time has very little effect on the depth.

At 1800° F. and 1950° F. the 15-pt. and 25-pt. curves show a greater rate of penetration; the curves at 1950° F. having by far the greater slope. In both the 1800° F. and 1950° F. tests the 35-pt. carbon gives a reverse slope; the three-hour test showing a deeper effective hardness than the seven-hour test. At present we are at a loss to explain this, since it appears contrary to the appearance of the fractures; yet both the tests at high temperature show the same results.

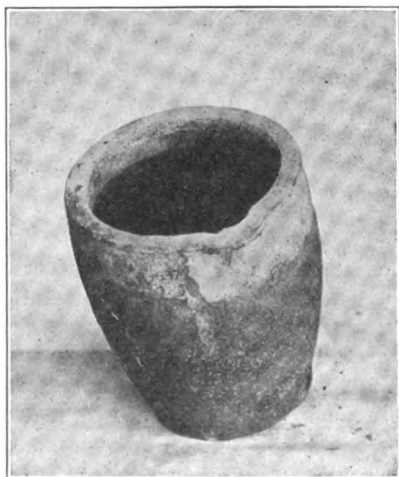


FIG. 7—A GRAPHITE CRUCIBLE WAS USED IN THE HIGHER TEMPERATURES

The Fractures

Duplicate pieces from each test were hardened and broken. These fractures have been grouped and photographed for comparison. The depth of cementation in each case seems to be consistent with the file test, with the exception of the 35-pt. carbon steel. In general, however, the case appears from the fracture to be deeper than that determined by the filing test.

Those pieces treated at the lower temperatures were broken with difficulty, and the fractures of the low carbon steel showed a tendency to be fibrous, the case being quite distinct from the core; while with the 25 and 35-pt. carbon at the low temperatures the core was much finer and rather crystalline, with less distinction between the core and the case.

At the higher temperatures the pieces broke brittle and showed a coarse, very crystalline structure; the carbonized ring as a rule being clearly distinct from the core.



FIG. 8—THE TEST PIECES WERE PUT THROUGH THE MILLING MACHINE

In our opinion the best results can be obtained at a minimum cost for fuel by carbonizing at a temperature between 1900° F. and 2000° F. and regulating the time to get the proper depth. Cast-iron boxes will hardly stand this temperature, but the Norton Company are experimenting with a box of refractory material that will give continuous service at high temperature. This heat, as we have found, weakens the core, but this difficulty can be overcome by heating the steel up to about 1350° F., cooling slowly and then hardening at 1400° F.

It is a known fact that the higher the carbon content in steel the lower is the point of decalescence, and inasmuch as many of our pieces hardened at 1450° F. showed a coarse fracture of the carbonized section, and as it

was possible to harden the case below 1400° F., it was concluded that the converted steel was of a high per cent of carbon.

We are indebted to Pratt & Inman of Worcester, Mass., for the steel used in these experiments.



High-Speed Steel in the Railroad Shop

J. CREEDON

Three years ago our company built new shops, and at the same time installed new and improved machinery and also bought all kinds of high-speed cutters, taps, reamers, etc.

These tools were put to work. Some of them have done well, while more of them broke and got very dull. They had to be annealed, re-cut and hardened again.

At this time we did not have any improved way of doing this work, other than the common forge, and all depended on "the man behind the gun"—the poor tool dresser. While in some instances his work was satisfactory in others we experienced a whole lot of dissatisfaction, especially on high-speed tools. To overcome this I "cut out" a small portion of our blacksmith shop and built up what is called a hardening shop to do this work.

I have one annealing furnace, 72 by 30 by 23 inches, where we do all casehardening and annealing of high-speed steel, also water steel. We have all sizes of cast-iron boxes to suit the different sized pieces; pack them in charcoal and put the boxes in the furnace in the morning, heat them

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up to about 1500 degrees Fahrenheit for about 9 hours; shut down at night and let boxes remain there until the next morning. We then take the boxes out and let them cool down on the floor, then we have what

the cast-steel pot and use a Dixon graphite crucible. We use four sizes of crucibles to suit the different classes of work. These crucibles are used altogether for high-speed tool steel, such as taps, cutters, reamers

when hardened at 1900 to 2000 degrees in this oil we find that the tool will give good service.

We have tried fish oil, but it is no good for this work; our impression being that it is too dead. Whereas,

TIME	TEMP.	15 pt. C.			25 pt. C.			35 pt. C.		
		Hogan	Greene	Average	Hogan	Greene	Average	Hogan	Greene	Average
3	1500	.015	.020	.0175	.016	.014	.015	.017	.017	.017
5	1500	.020	.022	.021	.026	.0275	.027	.025	.028	.0265
7	1500	.020	.019	.0195	.022	.025	.0235	.029	.029	.029
3	1650	.027	.030	.0285	.029	.031	.030	.039	.035	.037
5	1650	.028	.030	.029	.033	.031	.032	.035	.044	.0395
7	1650	.033	.036	.0345	.039	.040	.0395	.034	.038	.036
3	1800	.035	.030	.0325	.058	.063	.0605	.092	.095	.0935
5	1800	.058	.062	.060	.056	.062	.059	.070	.0735	.072
7	1800	.055	.057	.056	.064	.064	.064	.060	.066	.063
3	1950	.055	.059	.057	.067	.065	.066	.117	.103	.110
5	1950	.095	.086	.0905	.095	.082	.0885	.111	.109	.110
7	1950	.108	.108	.108	.120	.127	.1235	.103	.101	.102

Table showing depth of case on test pieces after heating at various temperatures for various durations of time.

you may call proper annealing without a scale on the material and as soft as a machinist requires it. This is the method of annealing any kind of tool steel.

I have a lead furnace, 36 inches deep by 10 inches wide, where we harden all our long carbon steel reamers which are 30 inches long. This we had to do, as our general foreman ordered all the long reamers in the shop to be annealed and recut, so we had to harden them in this lead pot and temper them in a hot oil bath. Now the way we do this is to heat the lead pot up to 1500 degrees and quench the reamers in salt water; they are then very hard—too hard to use. We then draw them in hot oil to 373 degrees Fahrenheit, and that will give a first-class cutting tool. Treat all carbon steel in this manner, varying according to the class of work to be done.

Now we have another lead pot furnace, 16 inches deep by 9 inches wide, where we can interchange in

and all such tools made of high-speed tool steel, which are a great many now.

If we have a high-speed cutter to sharpen, say 4-inch diameter, 6 inches long, spiral teeth, very thin and sharp, we always make it a point to get all the high-speed tools that we can, so as to harden them at once. We then start the small lead pot up to about 1900 degrees Fahrenheit. In the meantime we have the cutters or cutter in another open oil muffle furnace, preheating to a dark cherry red. We then work up the lead furnace to about 1950 or 2000 degrees and then place the cutter in the hot lead for about two or three minutes, and then we have a fine even heat on our cutter. Then we dip them into an oil bath that holds about 50 gallons of oil, 25 gallons of paraffin oil and 25 gallons of lard oil. You can call it half and half with two bushels of fine table salt. We have one coil of $\frac{1}{2}$ -inch pipe at the bottom of this tank with $\frac{1}{8}$ -inch holes about every 6 inches apart. Before we harden the cutter we put the air on for a couple of minutes and get the salt and the entire contents mixed up and then shut off the air until the oil settles and then drop in cutter and work it around the oil tank until nearly cold, then drop it into the basket made of front end netting that we have placed quite a ways down in the tank. Leave all tools in the oil until cold. This work can be done on several tools until the oil gets too hot.

We use Rex AA and Mushet high-speed tool steel for all this work, and

this half-and-half oil that we mentioned is very thin and hugs onto the tool, which enables it to quench so much quicker.

We also have a muffle furnace where we harden high-speed tool steel and can do a very fine job at the same degree of heat, as the oil does not come in contact with the tool.

Every railroad shop should have a lead pot furnace, as it does not cost very much to run it and it is always ready when a job comes along. We harden all cold chisels, capes and round noses, also all the air hammer chisels in the lead furnace. We have two pairs of tongs with springs on them so that a man can hold and harden three chisels at one time.

The cast-steel pots used in this furnace are very durable and give very good service. They can stand almost 1900 degrees and last a long time.

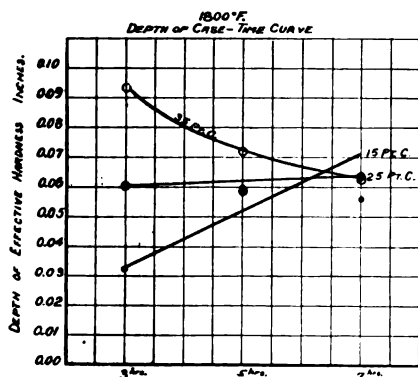
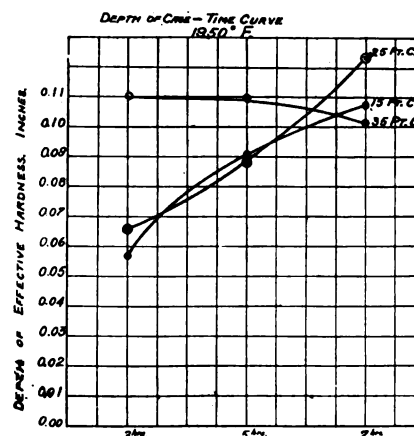


CHART SHOWING DEPTH OF CASE AT 1800 DEGREES



DEPTH OF CASE AT 1950 DEGREES FOR DIFFERENT PERIODS

The following articles comprise our hardening plant:

One 72 x 30 x 28 inches Ferguson furnace.

One 36 x 10 inches cast-steel lead pot furnace.

One 16 x 9 inches cast-steel and crucible lead pot furnace.

One 14 x 6 x 8 inches cyanide furnace with cast-steel pot on top.

One 24 x 12 x 16 inches muffle furnace.

One 36 x 18 x 14 inches deep tempering oil furnace.

One 24 x 9 inches diam. cylinder with $\frac{1}{2}$ -inch pipe, coiled around with

and having a plant of this kind installed in a railroad shop means that you can put hardening failures up to the steel man and relieve the tool-smith who has been censured for years.

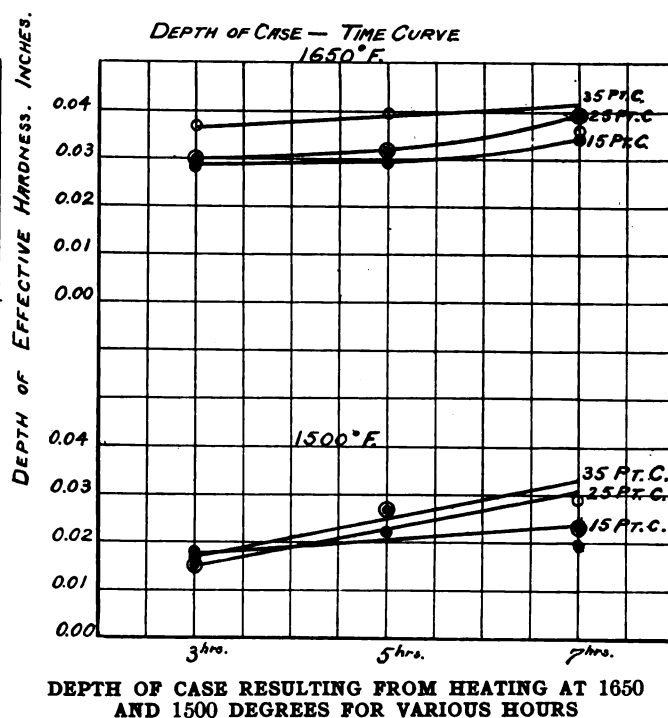
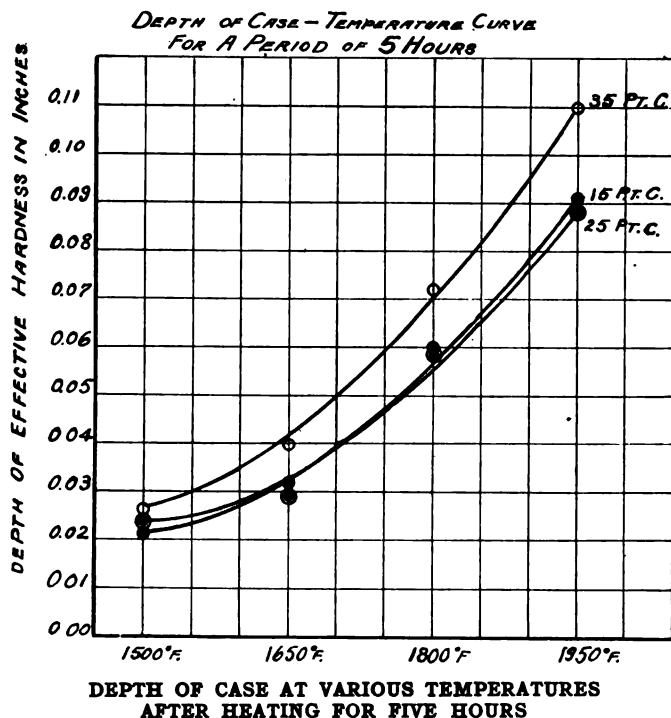
Smith-Shop Efficiency

J. T. McSWEENEY

There are a great many things to be considered in shop efficiency. Every foreman is trying to have harmony with discipline among the men in his shop. No shop can attain high efficiency unless harmony exists. To

careful analysis of its special conditions and requirements. System advice from the outside will help, but you should not be controlled by it. See that a broad view of all subjects be taken and provisions made for dovetailing them together. Don't issue any orders unless you intend to live up to the order and don't issue too many. Be always on the lookout for improvements from any responsible quarter to cheapen the cost of the material manufactured.

In adjusting the improvements be careful in selecting that which will give the best results. Also one of



$\frac{1}{16}$ -inch holes. This we use for hardening high-speed steel tools.

One 50-gal. oil bath with half paraffin and half lard oil.

One 50-gal. salt water tank.

One fresh water tank, 6 feet x 3 feet x 4 feet deep with air pipe and full pressure of water from bottom of tank.

One W. H. Bristol pyrometer which will register from 1 degree to 2800 degrees Fahrenheit.

One thermometer that will register from 100 to 650 degrees Fahrenheit.

All our lathe and planer tools are dressed and hardened by the tool fire smith the usual way. We use compressed air to harden nose of tool and it gives first-class results.

Most all our hardening at the hardening plant is done by a helper,

produce this you should have as much light in your shop as you can by keeping your windows clean. If possible have the walls whitewashed every year. Do not let the finished material lie on the floor of the shop. Put it on the outside in a pile, not scattered. Also have a place to receive the material to be repaired. Don't let it into the shop until you are ready to repair it. In this way you will have no accidents on account of not having room for the men to work and will do a great deal more work per man than if hemmed in by a lot of old and new material. You must have a good organization in your shop. It is up to the foreman to be the leader in the organization as well as the organizer. The best type of shop system is gotten not from the outside, but in the shop itself through

the best things in shop efficiency is to have your machinery kept in good repair. This will go farther to keep the shop up to the standard. There is nothing worse to look at in a shop and which lowers the efficiency more than a machine neglected or tools not taken care of. Steam pipes and air pipes blowing or leaking are also some of the things that lower the efficiency of the shop.

A Practical Talk on Steel Working

WM. F. STANTON

The difficulty with the average toolsmith is that he is in too big a hurry and does not heat the steel in a proper manner. Carbon steel should be heated in a clean fire and kept

THE AMERICAN BLACKSMITH

His first stop was at the grocer's. He told the proprietor that he had called to present him with a little reminder, that he would appreciate any business the grocer might send him, and then Jack left a neat calendar bearing his name and business card—"his sign" as he called it.

He called on many of the other horse and vehicle owners that day, spoke to them in about the same way



PRIZE WINNING BEAUTIES

and always left a calendar with his compliments.

It didn't take long for that town to wake up to Jack Lewis' ability as a general smith and it wasn't long before Jack put in another forge and increased his force to four men instead of one.

The calendar used by Jack Lewis was an AMERICAN BLACKSMITH calendar. But it wasn't as pretty as the calendar we are publishing this year. Everyone who has seen it says that THE AMERICAN BLACKSMITH calendar for 1913 is by far the most pleasing one we have yet published. It seems to meet the approval of everyone—and if you use it to advertise your shop you'll find it pleasing your customers and bringing you business. Ask about our 1913 calendar offers.

Opportunities

Here are listed a number of live opportunities for live blacksmiths—towns and localities where blacksmiths are needed. If you want to start anew and if you have the necessary energy, skill and perseverance to stick to business until business sticks to you, get into touch with these business chances. Write to the man or firm named under each address

Nebraska—

At Mysted—Address Soelberg & Jessen.

New Hampshire—

At South Newbury—Address E. A. Blodgett.

New Jersey—

At Alpha—Address Alpha Supply Co.
At Port Elizabeth—Address Postmaster.

New York—

At Verplanck—Address G. W. Waugh.
At North Spencer—Address F. D. Cowles.
At Lakeside—Address W. G. Willard.
At Adrian—Address F. E. Husk.
At Bennington—Address J. Heintz.
At Vailgate—Address Postmaster.
At Otselec—Address H. F. Grover.
At Freetown Corners—Address C. D. Carter.

This is described as a good opening.

At Ramapo—Address Sutherland, Lent & Co.

At Kiamasha—Address Postmaster.

At Raymondville—Address C. C. Bush.

At Hannawa Falls—Address I. Whitford & Co.

At Greenville Center—Address Postmaster.

At Protection—Address J. W. Kramer.

At Retsof—Address Postmaster.

At Livonia Center—Address Coy & Lindaley.

At Lowman—Address J. L. Bosworth.

At Fishers—Address G. P. Fowler.

At Napoli—Address E. B. Worth.

At West Constable—Address W. S. Ordway & Co.

At Manorville—Address E. M. Lane.

At Westons Mills—Address Geo. Reidon & Son.

At Ronkonkoma—Address Postmaster.

At Perth—Address C. H. Colding.

At Spring Glen—Address Postmaster.

At Sabanon Springs—Address Haight Bros.

At Victory Mills—Address Postmaster.

Oklahoma—

At Lee—Address J. A. Watley.

Oregon—

At Bay View—Address Postmaster.

At Belle Fontain—Address V. M. Woodcock.

At Lewisburg—Address Postmaster.

Smith needed badly here.

Pennsylvania—

At Wheatland—Address Postmaster.

At Whitsett—Address Jas. E. Farr.

At Springs—Address Postmaster.

At Zionhill—Address C. L. Kauffman.

At Pawling—Address R. D. Moch.

At North Heidelberg—Address Postmaster.

At Seeleyville—Address W. Smith.

At Luxor—Address Jamieson Supply Co.

At Sugar Hill—Address C. M. Prindle.

At Elco—Address W. H. H. Kent.

At Windsor Castle—Address C. S. Merkel

At Saville—Address R. B. Rodgers.

At Mount Sterling—Address Postmaster.

At Charlesville—Address John T. Hunt.

At Lungerville—Address Postmaster.

At Wrightstown—Address J. C. Lugar.

At Trexler—Address A. Trexler.

At Jersey Mills—Address E. Horn.

At Coalbluff—Address Valley Supply Co., No. 10.

At Isabella—Address Postmaster.

At Natalie—Address Natalie Store Co.

At Stockton—Address Postmaster.

At Van Ormer—Address Postmaster.

At Ohioville—Address Postmaster.

At Slate Run—Address Postmaster.

At Slateford—Address Postmaster.

At Walsall—Address Postmaster.

At Chambersburg—Address G. E. Frommeyer.

At Oak Station—Address J. C. F. Galy.

At Sonman—Address Sonman Store Co.

At Lock No. 3—Address Miners Supply Co.

At La Belle—Address Postmaster.

At Dewart—Address Postmaster.

At Logan Mills—Address Postmaster.

At Kennard—Address J. M. Little, Sons & Co.

A good location for a good man.

At Maple Hill—Address A. G. Decker.

Want to hear from good man.

At Russell Hill—Address Postmaster.

Good opening—shop awaiting good man.

At Ganister—Address Blair Supply Co.

At Johnsville—Address Postmaster.

At Fitzwatertown—Address Postmaster.

At Lash—Address D. T. Marsh.

At Instantner—Address Postmaster.

At Arrow—Address Davis Supply Co.

At McCance—Address Postmaster.

At Horatio—Address Postmaster.

At Brandt—Address H. W. Lange.



How's Business?

When a friend comes up to you, greets you with a slap on the back and asks: "How's Business?" do you know? What is your answer? What do you know about your business? How is business, right now? I don't mean, is business good or bad. I don't mean, is business slack or rushing.

I mean How Is Business?

I mean how are profits, expenses and all the other items that go to make up your business.

When you say business is good—do you know "for sure"? Do you know how good?

Or when business "is bad"—do you know how bad?

You cannot answer those questions unless you know how business is. And you don't know how business is unless you know profits, losses, expenses, costs and all the various items that go to make up your business.

Do you know after you've put on a set of shoes what those shoes have cost you in time, material and labor? If you don't know, how can you know how business is?

Do you know if the paint shop is paying?

Do you know if the woodworking department is making a profit?

When you put in an axle for a carriage owner, do you know how much profit you make? Do you know if you are getting the profit you figure on?

Unless you can answer these questions you cannot reply to my question: "How's Business?"

If you don't know expenses, costs, profits, losses, you don't know your business. You don't know and can't know these things unless you keep proper business records of your business.

Make a point of knowing "How's Business."

NOTE:—This is the Editor's second talk on business, prices, profits and costs. The third talk, "Guess Work vs. Know Work," will appear next month.

The Blacksmith

This ballad is from "Pills to Purge Melancholy, Compounded of Witty and Ingenious Ballads, Songs and Catches and Other Pleasant and Merry Poems." The third Edition, enlarged, printed by A. G. and J. P., and sold by Henry Playford near the Temple Church, London, and dated 1682.

Of all the trades that ever I see,
There's none to a blacksmith compared may be,
With so many several tools works he,
Which nobody can deny.

The first that ever thunderbolt made
Was a Cyclops of the blacksmith's trade,
As in a learned author is said,
Which nobody can deny.

When thundering like we strike about,
The fire lightning flashes out,
Which suddenly with notes we doubt,
Which nobody can deny.

The fairest Goddess in the skies,
To marry with Vulcan did advise,
And he was a blacksmith grave and wise,
Which nobody can deny.

Vulcan he to do her right,
Did build her a town by day and by night,
And gave it a name which was Hammer-smith Height,
Which nobody can deny.

Vulcan further did acquaint her,
That a pretty estate he would appoint her,
And leave her Sea Coal Lane for a joynter,
Which nobody can deny.

And that no enemy might wrong her,
He built her a fort you'd wish no stronger,
Which was in the Lane of Ironmonger,
Which nobody can deny.

Smithfield he did cleanse from dirt,
And sure there was great reason for't,
For there he meant she should keep her court,
Which nobody can deny.

But after in good time and tide,
It was by the Blacksmith rectified,
To the honour of Edmund Ironside,
Which nobody can deny.

The common proverb, as it is read,
That a man must hit the NAIL on the head,
Without the Blacksmith cannot be said,
Which nobody can deny.

Another must not be forgot,
And falls unto the Blacksmith's lot,
That a man must strike while the IRON is hot,
Which nobody can deny.

Now if to know him you would desire,
You must not scorn but rank him higher,
For what he gets is out of the FIRE,
Which nobody can deny.

Now here's good health to Blacksmiths all,
And let it go round, as round as a ball;
We'll drink it all off, though it cost us a fall,
Which nobody can deny.



Postage-stamp tenacity is a good thing—just stick until you arrive.

There would be more great men if more of us were willing to put in the time and work necessary.

It's pretty hard to lose trade when you make honest efforts to build it up—in fact, it's almost impossible.

"He doesn't know when he's licked" is a pretty good thing to say about a man—in our estimation.

If you're in business for business—get up and get some. Certainly no one can object to your going after business.

The man who waits for something to turn up, will never make "failure" spell "success."

Keep your brain working and then you'll never fall back on that old time-worn moss-covered excuse "I didn't think."

Remember how to spell "Square Deal," and also how to deliver one to every man with whom you do business.

Yes, certainly! Systematize your work and business, but don't get all tied up with red tape.

Of course, good machines cost money, but remember, the better they are the sooner they pay for themselves.

If you don't believe in counting your chickens before they're hatched, why don't you eat the eggs and be sure of getting twelve to a dozen?

Carelessness is twin brother to negligence, and the two are responsible for more mistakes in business than all other causes combined.

A misunderstanding with a customer corrected so as to leave a sour taste in the customer's mouth is worse than no correction at all.

There's a big difference between overhauling a wagon for one customer and replacing an axle clip for another, but there should be no difference in the courtesy extended to each.

There's a movement on foot to start an Antiquated Order of Fossilized Farriers. Tom Tardy is being boosted for president and Dan Dillydally says he'll take the vice-presidency if the order will pay his board.

"Give a dog a bad name and he will soon be shot." Call a man a deadbeat and he will likely live up to it. Give a man credit for paying promptly and he will try to live up to the name.

Ever think to try the telephone as a means of getting money? Try it the next time; when you've sent him a bill and have asked him to remit,—and he doesn't, just ring him up on the phone as a reminder.

Boost the craft. You don't approve of the chap who knocks the man or firm who employs him—who enables him to make a living. Then why knock the trade that enables you to make a living? Boost.

Boost and the Craft boosts with you,
Knock and you knock alone;
For the smith worth while
Is the smith who will smile
And boost the craft along.

The best time to adjust credit matters is before you deliver the goods. Then if things don't suit you, you can withdraw. Better have the material in the shop and the labor undone than in a dishonest customer's hands and not paid for.

A smith-shop can be made attractive—thousands of examples to the contrary notwithstanding. Lay out and plan the shop and yard intelligently and then care for both intelligently, and your business establishment will stand out boldly in contrast with the ordinary looking shops.

Don't think that because you have never sold an automobile or a silo or reaper that you cannot do so. You never will really know until you try. And then you will wonder why you didn't take on a sideline before. Better get busy—connect up with some good maker of implements or automobiles.

Length of experience may mean little or much. One man may be a crossing sweeper for twenty years and yet not know what his broom is made of, while another man starting at the same time on similar work may in a year have invented an automatic sweeper. It depends upon the man whether experience is little or much.

If it's hot or if it's cold,
Keep a-hammerin'.
If you're young or if you're old,
Keep a-hammerin'.
Keep a-poundin', stampin' 'round,
Keep a-go'in' like a hound,
Jes' y' make this good ol' sound—
Keep a-hammerin'.

Keep your home town editor posted on what is doing in your shop. Nothing to interest him? How about the new helper? How about the old one taking a vacation or a wife? How about your own vacation or moving into a new home? How about that new engine, or blower, or calking machine? These are all items suitable for publication in the local news column. See that the Editor gets hold of them.

Nothing can keep you from success if you know your trade, how to buy, to sell, to advertise, to collect, to conduct business. Pretty much to know? Learn, use your eyes and ears; talk to successful business men; ask sensible questions; consult trade journals; ask your Editor, and then apply the knowledge you gain by mixing it with your own brains. Make up your mind to be a success or bust. The right kind of thinking, backed by the right kind of working, and nothing can keep success from staring you in the face.

Ever hear of a woman putting off the family washing to go visiting? Yet Tom Tardy postpones cleaning up shop for even lesser reasons. We called on Tom the other day. After climbing over a pile of old shoes, a rusty bobsleigh, a mass of broken shoe kegs and nail boxes and a tumbled forge we finally found him in what he calls his office. When asked why he didn't clean up shop he said: "Hain't got time." And then when we observed that he was not very busy just then he said: "Well, my wife said t' bring home some fish tonight an' so I'm goin' t' ketch 'em 'stead o' buyin' 'em."



Our Honor Roll

Better Do It Now

This month thirty-four new names are added to Our Honor Roll. It won't be many months before the 1915 class will be dropped from this page. Better get a place up near the leaders.

And are you watching the class of 1922? You see it's easy to get into that class. For example: If your subscription expires this month—November—all you need do is to send us a remittance of \$5.00 (\$7.00 in Canada—1£. 14s. in other countries) and we'll give you ten years' credit, and mark your account paid, up to November, 1922. BETTER DO IT NOW.

Better insure your subscription now. You save money, time, trouble and annoyance. On the ten-year subscription you save five whole dollars; to say nothing of the time and trouble of subscribing each year and running the risk of losing copies of the paper.

Just think it over—those five dollars are worth saving. And you may as well save them as others do. But do it today—don't wait "till after election." It won't matter whether it's Taft, Wilson, Teddy, Debs or anyone else—the great majority of us will still continue to swing hammers and ring anvils.

	U. S. and Mexico	Canada	Other Countries
Two years.....	\$1.60	\$2.00	10 shillings.
Three years.....	2.00	2.70	14 shillings.
Four years.....	2.50	3.20	18 shillings.
Five years.....	3.00	3.75	1 pound.
Ten years.....	5.00	7.00	1 pound 14s.

And then, too, you can gain a place on Our Honor Roll by getting new subscribers. Just show this big list of honor readers to your brother craftsmen. A paper must be pretty good to get a practical man's subscription years and years in advance. Then send in the new subscription orders and we will give you six months' credit on your own account for each new order you send us. That will help you toward an honor place. Will you tell your neighbor?

NAME	Subscription Paid to	NAME	Subscription Paid to
W. C. WATT, Kan.	Dec., 1930	W. McCoy, Kan.	May, 1917
I. J. STITES, N. J.	Jan., 1928	A. GUSTTLER, Tex.	May, 1917
W. R. TURNER, Man.	Oct., 1923	C. F. J. LORENZ, N. Y.	May, 1917
T. BRADLEY, N. S. Wales	Mar., 1923	A. DATWYLER, Ohio	May, 1917
W. LAWSON, N. Z.	Nov., 1922	H. G. MARRIOTT, Utah	Apr., 1917
J. N. SKOW, Ia.	Sept., 1922	E. THIBAUDEAU, Wis.	Apr., 1917
A. D. STANDIFORD, Wash	Sept., 1922	W. PICKERING, S. Africa	Apr., 1917
T. TEMKIEWICZ, Que.	Sept., 1922	ED. BURROWS, England	Apr., 1917
A. PREIFFER, Ohio	Aug., 1922	L. KAUSCH, Wis.	Apr., 1917
J. ERMAN, Ark.	July, 1922	J. M. BROWN, Tex.	Apr., 1917
ROBERT TOCHTER, Cal.	June, 1922	J. C. WOODS, W. Aus.	Mar., 1917
E. ANDERS & SON, S. Aus.	May, 1922	C. BOULTON, N. S. Wales	Mar., 1917
LOUISA CARRIAGE WKS., Va.	May, 1922	C. A. HAWKINS, Ore.	Mar., 1917
S. SMITH, Tex.	Apr., 1922	A. L. MONYCOFF, W. Va.	Mar., 1917
J. W. HAAR, La.	Mar., 1922	J. PETERSON, Ia.	Mar., 1917
E. A. DILLON, Nev.	Mar., 1922	J. ANDERSON, Tas.	Mar., 1917
D. W. SMITH, R. I.	Mar., 1922	A. J. NEILL, Vt.	Mar., 1917
D. F. KUSTER, Wash.	Mar., 1922	ED. DEITRICH, Ind.	Mar., 1917
R. H. KEITH, Ia.	Jan., 1922	LEWIS CHASE, N. Y.	Mar., 1917
O. M. JOHNSON, Minn.	Oct., 1921	E. O. LEE, S. Dak.	Mar., 1917
H. FELDUS, Neb.	Sept., 1921	S. STAMPLE, Ohio	Mar., 1917
W. K. KLINE, Kan.	May, 1921	R. S. GUGISBERG, Kan.	Mar., 1917
ED. GRIMM, Tex.	Mar., 1920	J. S. HASKELL, Col.	Mar., 1917
R. S. CRISLER, Ky.	Jan., 1920	W. L. ROARK, Tex.	Mar., 1917
I. M. TOWNSEND, Cal.	Apr., 1919	A. R. BARLOW, Tex.	Mar., 1917
C. WILLIAMS, W. Aus.	Mar., 1919	C. A. WHITACRE, Ohio	Mar., 1917
T. P. CONSIDINE, Mass.	Dec., 1918	B. P. CARNEY, Ill.	Mar., 1917
PETER COCKS, W. Aus.	Sept., 1918	A. J. H. WEGENER, S. Africa	Feb., 1917
R. J. TOMPKINS, Tex.	Sept., 1918	H. SCHNETTE, Ill.	Feb., 1917
A. DISCHER, Aus.	Aug., 1918	E. DOUGHMAN, Ohio	Feb., 1917
ALBERT MELLUM, N. D.	June, 1918	J. W. HAUGHT, Ill.	Feb., 1917
RICHARD BRENNER, Tex.	Feb., 1918	CHAS. F. GIESE, N. Mex.	Feb., 1917
W. F. HILL, N. C.	Feb., 1918	M. E. GOLLER, Pa.	Feb., 1917
P. J. DALLY, W. Aus.	Jan., 1918	J. POTTHOFF, Neb.	Feb., 1917
J. MORROW, Pa.	Jan., 1918	G. M. GARRETT, Mich.	Feb., 1917
MESSE BROS., Vict.	Dec., 1917	ERNEST FINLEY, Pa.	Feb., 1917
E. M. WURSTER, Mich.	Nov., 1917	A. TILLMAN, Cal.	Feb., 1917
S. B. FREY, Ind.	Nov., 1917	WALKER BROS., N. Z.	Feb., 1917
Z. A. STEINKE, Ohio	Nov., 1917	G. W. WHITTINGTON, W. Va.	Feb., 1917
J. N. BATHGATE, N. Dak.	Nov., 1917	J. H. HOYLE, S. Africa	Feb., 1917
J. W. RAPS, N. Y.	Oct., 1917	IRVING BROS., N. Y.	Feb., 1917
W. C. RONEY, Pa.	Oct., 1917	F. ROSCHY, Pa.	Feb., 1917
J. N. MILLS, Ky.	Oct., 1917	AUGUST MILLET, Ill.	Feb., 1917
I. E. SPROUD, Me.	Sept., 1917	C. P. ROBERTSON, S. Africa	Feb., 1917
M. DEJAGER, S. Africa	Aug., 1917	S. HETEM, S. Africa	Jan., 1917
F. HOWARD, Kan.	Aug., 1917	G. A. GURLEY, Ore.	Jan., 1917
H. FERREL, Ill.	Aug., 1917	F. K. WADE, Me.	Jan., 1917
J. MCMEKEN, N. Z.	Aug., 1917	L. V. SENN, Neb.	Jan., 1917
F. H. GIERKE, S. Aus.	Aug., 1917	S. H. AUSTIN, N. Y.	Jan., 1917
F. G. STONE, S. Africa	July, 1917	H. KAHL, Ia.	Jan., 1917
H. J. DEVONSHIRE, N. Z.	July, 1917	J. H. BERGEN, Kan.	Jan., 1917
V. J. HUBBARD, N. Y.	July, 1917	F. G. A. WILLIAMS, S. Aus.	Jan., 1917
W. R. GELLING, S. Africa	June, 1917	ALFRED CASS, N. Z.	Dec., 1916
J. H. BAKENBERG, S. Africa	June, 1917	H. GRIMM, Utah	Dec., 1916
A. R. HALLENBERG, N. Y.	June, 1917	A. H. GOODING, S. Aus.	Dec., 1916
F. C. BOCK, Neb.	June, 1917	LEONARD SMITH, N. J.	Dec., 1916
YOST & HALVORSON, Minn.	May, 1917	C. F. SHAW, Man.	Dec., 1916

NAME	Subscription Paid to	NAME	Subscription Paid to
W. ELWARD, Pa.	Dec., 1916	G. N. FOLLMAR, Neb.	Mar., 1916
W. W. EOLY, Pa.	Dec., 1916	W. WILLOUGHBY, Mich.	Mar., 1916
JOS. BOYER, Mich.	Dec., 1916	H. HOFFMEYER, N. J.	Mar., 1916
J. WILLIAMS, N. S. Wales	Dec., 1916	FRANK L. LOCKE, N. Y.	Mar., 1916
J. H. W. SCHNEIDER, Cal.	Dec., 1916	FRANK L. EVARTS, Conn.	Mar., 1916
W. SAUER, Minn.	Dec., 1916	C. R. WINGET, Vt.	Mar., 1916
F. F. DARLING, Cal.	Dec., 1916	H. & J. CHISHOLM, N. Z.	Mar., 1916
CHAS. NEWLAND, Cal.	Dec., 1916	C. F. MOKKENTEN, Aus.	Mar., 1916
J. T. BRAHM, Ia.	Dec., 1916	H. D. PHILLIPS, S. Aus.	Mar., 1916
P. H. ST. LOUIS, Wis.	Dec., 1916	J. B. FRY, Wash.	Mar., 1916
A. E. NICKOLA, Okla.	Dec., 1916	L. A. DOWNING, Cal.	Mar., 1916
C. J. HALL, Wash.	Dec., 1916	A. A. SCHREIBER, Tex.	Feb., 1916
BOB FRICK, Ala.	Dec., 1916	J. T. DILLARD, Tex.	Feb., 1916
JORIS BROS., Tex.	Dec., 1916	F. J. FLESSLER, N. Y.	Feb., 1916
R. CLEMENS, Conn.	Dec., 1916	E. P. JONES, Kan.	Feb., 1916
SCHREFFLEY & SCHMITT, Pa.	Dec., 1916	E. J. BISHOP, N. Y.	Feb., 1916
A. BRAUSE, Ohio	Dec., 1916	J. N. TYLER, Ohio	Feb., 1916
J. E. BRATTY, Mo.	Dec., 1916	PETER COX, W. Aus.	Jan., 1916
GEO. CASSIE, Scotland	Dec., 1916	CHAS. H. KERN, Ill.	Jan., 1916
JOHN KAIN, Ky.	Dec., 1916	J. H. ECROYD, Cal.	Jan., 1916
F. W. HOWELL, Ill.	Dec., 1916	THOMAS HORNE, Ariz.	Jan., 1916
TOM NOLAN, S. Aus.	Nov., 1916	CHARLES TUCKER, Mich.	Jan., 1916
H. J. FRENCH, N. Z.	Nov., 1916	M. KLITGOOD, N. Y.	Jan., 1916
F. N. BROWNING & SON, Ky.	Nov., 1916	O. STENNING, S. Dak.	Jan., 1916
J. MACIUS, Scotland	Nov., 1916	IVER JOHNSON ARMS AND	
P. GIESSEN, Ill.	Nov., 1916	CYCLE WORKS, Mass.	Jan., 1916
J. W. GRIBBLE, S. Aus.	Nov., 1916	FELDMAYER & SCHAAKE,	
W. G. SIM, N. Z.	Nov., 1916	Kan.	Jan., 1916
H. V. RUEHL, Ala.	Nov., 1916	CHAS. WINTER, Cal.	Dec., 1915
G. LINDBORG, Ind.	Nov., 1916	E. J. BUFE, Ia.	Dec., 1915
FITTMAN STELL, N. C.	Nov., 1916	GEO. SYKES, Aus.	Dec., 1915
J. S. FINKENBINDER, Ind.	Nov., 1916	W. PATRICK, N. Y.	Dec., 1915
R. D. WILKOM, N. Y.	Nov., 1916	JAS. A. SHARP, Mass.	Dec., 1915
A. W. WAITE, Cal.	Oct., 1916	J. KRAHULLEC, Ill.	Dec., 1915
C. W. ELLIS, Tex.	Oct., 1916	P. E. DAHLFURST, Cal.	Dec., 1915
J. P. SIMON, N. S. Wales	Oct., 1916	WM. BISHER, Ohio	Dec., 1915
E. A. KNAPP, N. Z.	Oct., 1916	C. A. JERNER, Neb.	Dec., 1915
L. J. HASKINS, N. S. W.	Oct., 1916	G. S. FISHER, Neb.	Dec., 1915
LOTHIAN & SKINNER, N.S.W.	Oct., 1916	PRINTERS SUPPLY COMPANY,	
W. B. KNOUFF, Ala.	Oct., 1916	Neb.	Dec., 1915
GORHAM BROS., Ia.	Oct., 1916	M. KENNEDY, Tasmania	Dec., 1915
W. H. F. BRAUCH, N. C.	Oct., 1916	WILLIAMS & TURNER, W. Va.	Dec., 1915
CLARK OLDS & CO., Neb.	Oct., 1916	C. J. ASH, Kan.	Dec., 1915
IRWIN SCOTT, N. Y.	Oct., 1916	F. H. JORLIN, Mass.	Dec., 1915
C. E. DURHAM, Kan.	Oct., 1916	C. W. AMES, Mass.	Dec., 1915
M. RINGO, S. Africa	Oct., 1916	C. L. SORENSON, Neb.	Dec., 1915
W. DELLEY, Queens, Aus.	Oct., 1916	E. WILLIAMS, N. Y.	Dec., 1915
J. J. ILER, N. S. Wales	Sept., 1916	W. URQUHART, N. Z.	Dec., 1915
JAMES POETTER & CO., Mo.	Sept., 1916	W. RUSE, Kan.	Dec., 1915
JNO. GOETZINGER, Ia.	Sept., 1916	L. S. KOCHER, Ia.	Dec., 1915
GEO. FLECKENSTEIN, Cal.	Sept., 1916	P. W. FRASER, N. Z.	Dec., 1915
GEO. HILL, Aus.	Sept., 1916	J. F. SHIMMER, Md.	Dec., 1915
E. C. BEARD, Aus.	Sept., 1916	J. MACCLURE & SON, N. Z.	Dec., 1915
J. K. GLINICKI, Mich.	Sept., 1916	J. D. RHODES, Ohio	Nov., 1915
OSCAR BUNNER, Md.	Sept., 1916	NORDSTROM BROS., Kan.	Nov., 1915
A. J. HAMMOND, Cal.	Sept., 1916	HUFF & HANSON, Wis.	Nov., 1915
ROBERT MURRAY, Cal.	Sept., 1916	J. P. CARRICK, Ind.	Nov., 1915
D. E. WRIGHT, Pa.	Sept., 1916	D. CODERE, Ill.	Nov., 1915
J. S. HASKELL, Col.	Sept., 1916	F. S. WOODY, Ia.	Nov., 1915
R. SOMMER, Aus.	Sept., 1916	GEORGE H. LISLEY, Mass.	Nov., 1915
J. A. SEQUIN, Can.	Aug., 1916	M. I. HUFF, Mo.	Nov., 1915
JAMES CLARKE, Jr., Aus.	Aug., 1916	STEPHEN WACHTER, Pa.	Nov., 1915
DISPATCH FRY LTD., N. Z.	Aug., 1916	C. J. WILLARD, Ill.	Nov., 1915
ERNEST E. DOTTY, Ohio	July, 1916	J. S. LEE, Wash.	Nov., 1915
C. C. ASHTON, Pa.	July, 1916	L. P. MORTENSEN, Mich.	Nov., 1915
HENRY FISHER, Tas.	July, 1916	R. L. WHITFIELD, N. S. W.	Nov., 1915
J. W. FOWLER, N. Z.	July, 1916	A. H. KNIGHT, S. Dak.	Oct., 1915
A. C. LODWIG, Cal.	July, 1916	A. WESTERMAN, Wash.	Oct., 1915
A. A. BARLKE, Mich.	July, 1916	J. F. HUMBERT, Md.	Oct., 1915
J. K. HANSEN, Aus.	July, 1916	O. F. MATSON, Utah	Oct., 1915
J. B. BARKER, Ill.	July, 1916	W. W. DAIRDS, Okla.	Oct., 1915
H. M. LARSEN, Wis.	July, 1916	FRED HENKEA, Mich.	Oct., 1915
GEO. P. MACINTYRE, Me.	July, 1916	W. FOULKES, England	Oct., 1915
JAS. A. BUCHNER, Mich.	July, 1916	N. W. HAMMOND, Col.	Oct., 1915
H. M. FINGER, N. Y.	July, 1916	P. G. DAIRDSON, N. Dak.	Oct., 1915
L. H. STRANGE, Viet.	July, 1916	C. N. MILLS, Cal.	Oct., 1915
P. O'DONNELL, Viet.	July, 1916	H. DIER, S. Aus.	Oct., 1915
R. J. HANCOCK, N. Z.	July, 1916	S. B. GOODSELL, Conn.	Oct., 1915
F. G. WILSON, Col.	July, 1916	D. F. HOLLOWELL, Ia.	Oct., 1915
I. H. HALL, Ind.	June, 1916	A. ROTH, Ill.	Oct., 1915
F. FULTON, N. S.	June, 1916	C. C. PERRY, Aus.	Oct., 1915
J. CHALMERS, S. Africa	June, 1916	SIDNEY STREVEN IMP. CO., U.	Oct., 1915
G. R. HARRISON, Aus.	June, 1916	W. H. FINDLAY, N. Z.	Oct., 1915
J. WATCICH, S. Africa	June, 1916	R. F. WATSON, Cal.	Oct., 1915
W. VOIGHT, S. Africa	June, 1916	H. E. STONE, Conn.	Oct., 1915
MARTIN JENSEN, Wis.	June, 1916	F. TEUBER, Ga.	Oct., 1915
CHESTER HUMBERT, Wis.	June, 1916	L. O. BREKKE, Wash.	Sept., 1915
LINCOLN UNDERHILL, Cal.	June, 1916	A. TAYLOR, Queens, Aus.	Sept., 1915
M. BROTON, N. Dak.	June, 1916	J. H. NEDER, Ore.	Sept., 1915
HANS ERIKSEN, Ill.	June, 1916	W. H. THOMAS, Pa.	Sept., 1915
C. MORRELL, N. Brunswick	June, 1916	G. A. LINDGREN, Ind.	Sept., 1915
J. O. CONRAD, Kan.	June, 1916	J. HELPS, Cal.	Sept., 1915
ADAM SCHMITT, Mich.	June, 1916	ALBERT BALLMER, Cal.	Sept., 1915
J. G. REEVES, S. Aus.	May, 1916	J. W. GLEASON, N. W. Ter.	Sept., 1915
I. H. LUNDER, N. Dakota	May, 1916	SEBASTIAN WAGON CO., N. Y.	Sept., 1915
JAMES SINCLAIR, W. Aus.	May, 1916	JOHN FINN, Ohio	Sept., 1915
H. BAKER, Aus.	May, 1916	J. E. MAYE, Wis.	Sept., 1915
E. Q. KREHBIEL, Kan.	May, 1916	W. H. MORTON, Mont.	Sept., 1915
C. H. CAIRNS, N. Y.	May, 1916	H. F. KRAHMER, Ore.	Sept., 1915
P. V. JOHNSON, Ohio	May, 1916	J. J. DORAN, Va.	Sept., 1915
F. E. SMITH, Vt.	May, 1916	W. H. MITCHELL, Mass.	Sept., 1915
C. A. STEBBINS, Kan.	May, 1916	S. W. WINCH, Vt.	Sept., 1915
SANFORD BAKER, Mo.	May, 1916	ED. HAMMILL, Cal.	Sept., 1915
E. B. ANDERBERG, Ill.	May, 1916	R. D. SIMKINS, Pa.	Sept., 1915
WELSH BROS., Ind.	Apr., 1916	T. J. REYNOLDS, Pa.	Sept., 1915
KELLHERR BROS., W. Aus.	Apr., 1916	WM. BATES, Tex.	Sept., 1915
P. A. PETERSON, Ia.	Apr., 1916	J. KNIGHT, England	Sept., 1915
G. F. BOWERS, Okla.	Apr., 1916	L. F. KUHN, Mexico	Sept., 1915
D. E. McDONALD, Fla.	Apr., 1916	A. W. WOOD, W. Va.	Sept., 1915
JAMES BAXTER, S. Africa	Apr., 1916	HUGH L. LYNN, Ky.	Sept., 1915
E. P. DIGMAN, S. Aus.	Apr., 1916	T. J. HOGAN, Kan.	Aug., 1915
W. H. WINGET, Vt.	Apr., 1916	C. M. BRANCH, Ill.	Aug., 1915
C. SCHMID, Neb.	Mar., 1916	M. E. MADDOX, Tex.	Aug., 1915
A. ROCKENSCHUP & SON, Ia.	Mar., 1916	R. T. MILLHOUSE, S. Africa	Aug., 1915
C. H. ALEXANDER, N. Y.	Mar., 1916	G. S. DAVIS, N. Y.	Aug., 1915
A. M. HAREBO, Wis.	Mar., 1916	H. P. SORENSON, Wis.	Aug., 1915
GEORGE HOWARD, Kan.	Mar., 1916	LEO BRUNS, Ia.	Aug., 1915

Ten Questions for the Month

The questions this month are very appropriately upon the subject of casehardening. These queries may seem very difficult to many readers, but not one of the questions cannot be answered by reference either to this issue or back issues of "Our Journal."

1. What is casehardening? Of what does the process consist?
2. What substance is used to bring about this result?
3. Why cannot coal be used? It is usually spoken of as a carbon.
4. What factor determines whether or not a substance rich in carbon can be used for carbonizing or casehardening steel?
5. Between what temperatures does steel absorb carbon?
6. What factor determines the success or failure of casehardening operations?
7. Is it best to use a mixture of carbonizing elements or one material alone?
8. Why is not the entire section of a given piece of steel hardened—i. e., why not harden the center as well as the outer shell?
9. Describe the actual practical method of securing a case of highly carbonized steel on the surface of a piece of steel of lower carbon content.
10. Does the casehardening process affect the core of the steel being treated? If so, how?

The answers to the above questions will appear in next month's issue. Write out your answers and then check them up with the answers appearing next month.

The Man Who Makes, Uses or Sells an Article Infringing Upon Patent, Trademark or Copyright

ELTON J. BUCKLEY

What is the legal status of a manufacturer, merchant or artisan who innocently, and in entire ignorance of the facts, makes, uses or sells an article which is an infringement upon some patent?

I have had several experiences recently which convince me that some information on this subject is needed.

Not long ago a salesman for a computing scale manufacturer was endeavoring to sell a number of his scales, on very favorable terms, to a large retailer. "Didn't I see in some paper that so and so had sued your company for infringement of his patents?" asked the retailer during the negotiations. "That is true," said the salesman, "and we shall defend the suit. But our fights do not touch buyers of our scales; the suit affects nobody but us, and you can therefore buy these scales with perfect safety."

The salesman's statement was wholly wrong. The person making, using or selling an infringing article, however ignorantly or innocently he does it, is equally guilty under the law with the man who knowingly and with fraudulent intent constructs an article which infringes upon another's patent. This is an apparently illogical and unfair attitude, but nevertheless it is the law. The theory on which it rests is that the fundamental principle of patent infringement is violation of the property rights of the owner of the patent. Obviously this is not a matter of intent—the property rights of the owner of a computing scale patent, for example, are violated in the same degree by merchants who use an infringing scale innocently and those who do it knowingly.

The Government will protect the owner of a patent in three rights—that of making, using or selling the article embodying the patent, or bearing the patented design if it is a design patent. And, more than that, the owner of an infringing article will not even be permitted to give it away as a premium, for this the law holds to be a constructive sale.

To explain this a little, take a manufacturer or merchant who runs across a little mechanical appliance to do in some improved way any one of the thousands of things that need to be done about a factory or a store. The appliance is patented and bears notice to that effect stamped in the metal. The thing is simple, and the manufacturer or merchant makes something like it. He is guilty of infringement upon the other's patent and can be sued for damages.

He is even guilty of infringement if he has done nothing but make the infringement. Even more is he guilty if he makes and uses, and in the highest degree is he guilty if he sells.

The latter is the way in which patent infringement usually amounts to the most—by the sale, through dealers, of articles embodying an infringement upon some patent. Even one such sale constitutes infringement and gives sufficient ground for a lawsuit.

Cases have frequently arisen, however, which have taken a little different turn from any of those above described. I refer to cases in which merchants or manufacturers innocently buy mechanical appliances and store fixtures—such as cash registers, computing scales, cash carrier systems, bookkeeping systems, and all manner of such things, and use them in their own business. If these are infringements upon some other man's patent, anybody using them, as I have explained, is fully as liable as the maker himself, and his plea of ignorance, or even producing a guarantee from the firm that sold to him that the article is not an infringement, is not under the law any defense whatever. If he can show entire ignorance of the facts, however, this usually has the effect of reducing the amount of damages which will be granted against him.

Neither is it necessary for the owner of a patented article to warn infringers as to anything about it. He can do what was done in a recent case—calmly wait until the manufacturer of an infringing article had made a considerable number, and has actually sold them to tradesmen, and then swoop down upon the lot of them. Of course, the gist of such a case is the question—is there an infringement? If there is, maker and seller are alike guilty.

There is one point, however, which has been flatly decided against the owner of a patent in every case in which it has arisen, and that is that the sale of the product of a machine or a process which infringes on a patent does not constitute infringement. For instance, the manufacturer of a breakfast food was granted a patent on a machine that did a certain work in a new way. Another manufacturer built a machine which infringed upon it, made a breakfast food and sold it. The manufacturer of the patented machine went after the other manufacturer, and also after all the wholesale and retail dealers who had sold the latter's product. The court held that while the manufacturer who had infringed the patent was of course liable, the dealers

were not, because there was no patent on what they had sold, viz., the food itself, and therefore there was no infringement. The patent was on the machine, and only those who made, used or sold an infringing machine—not the product thereof—were liable.

Any person who infringes another's patent in any of the ways I have described can be sued for damages, but the prosecutor can recover only the actual damages he can show he has sustained. In other words, no damages can be collected as a punishment, but only such a sum as will make the injured party whole again. This includes, however, the profits which the owner of the patent might have made if there had been no infringement. This principle almost always comes into cases against merchants who have sold infringing articles.

The law as to trade-mark infringement is wholly different. The seller of an article which infringes another's trade-name or trade-mark is not liable, unless he himself adopted the infringing name or mark. John Jones registers a trade-mark and adopts it on certain package goods, and James Smith unlawfully copies it. Smith is a manufacturer and sells his goods, bearing the illegal trade-mark, to

various dealers at wholesale. Jones' suit here, under the trade-mark law would have to be against Smith alone, as the responsible author of the infringing trade-mark, although if some retail dealer, after notice, persisted in selling the falsely trade-marked goods, the owner of the real trade-mark might obtain an injunction against him.

As to the sale of some articles which infringe upon a copyright, there is again a difference. Any person making or selling an article—book, advertisement, literary or musical production, chart, map, legal blank, engraving, cut, print, photograph, business forms, etc.—which infringes upon another's copyright, is liable only if he sells it knowing it to be an infringement.

(Copyright, Elton J. Buckley)

The Sign Over Your Door

"The sign over your door" is not enough—the folks who pass by your shop are the only ones who see it. The folks who go down the next street don't know your sign—why not take it to them? Take your sign right into their homes, offices and stores—right into the place where the need of your services arises. *THE AMERICAN BLACKSMITH* Calendar for 1913 will do it, and do it at a cost so small that you cannot afford to ignore this method of pulling more trade into your shop. Send your order today—NOW.



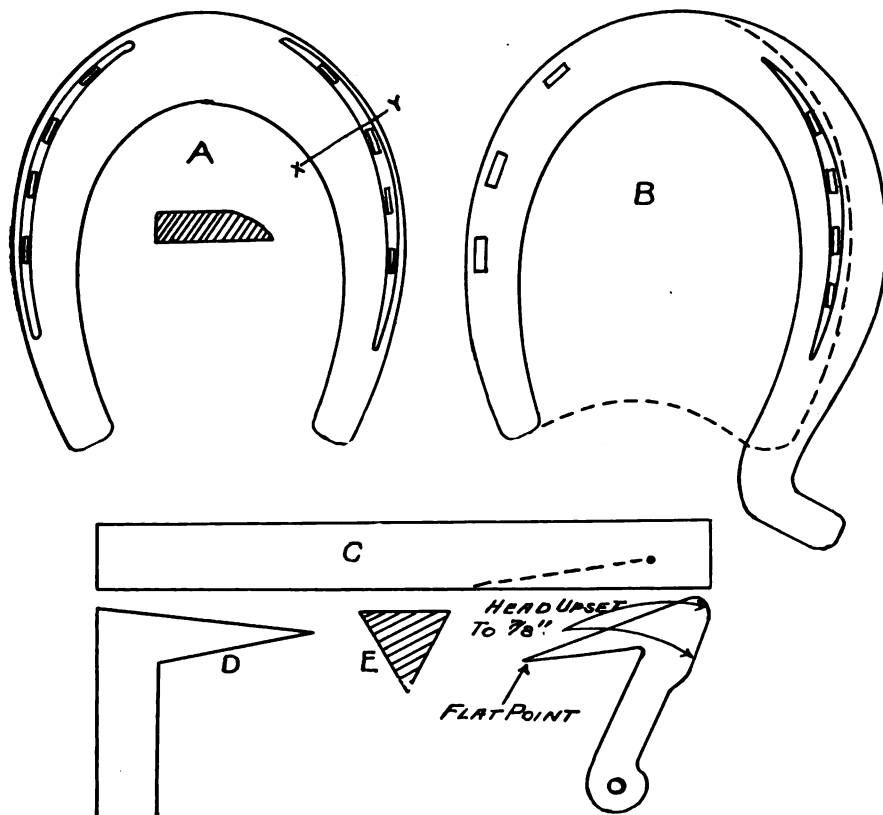
Two Special Shoes and A Timber Dog

R. F. WALKER
New Zealand

No two horses' action is alike; we must therefore shoe each one differently. I will describe how I shod one pacer that had a tendency to pull her shoes off. We put the front shoes on like ordinary ones, but cut the heels from the outside and inside, as shown in the engraving (section through X Y) to stop any chance of her getting on them and pulling them off. I find that a pacer steps on the near front shoe with the off hind one. I will explain how I shoe the hind feet to stop it. I make a shoe very wide from the toe to the heel on the outside, about one inch, and fuller for nails about $\frac{3}{8}$ inch from the inside edge, so that the greater part of the shoe is on the outside and very light on the inside; this I consider the best method of weighting a shoe. The engraving at B shows the shoe, the dotted lines representing the hoof. If any brother smith will take the time to shoe a horse in this way I believe that he will be more than satisfied with results.

This is how I make a timber dog for use on big logs in connection with a steam hauler. The lumbermen here say that they are the best that they have used.

Get a piece of Bessemer steel, $2\frac{1}{4} \times 1\frac{3}{8} \times 8$ inches long, and when hot take your chisel and cut as in the illustration at C. Don't cut right to the center of the stock, as it will leave the neck too weak. The next operation is to open it out as at D. Then draw the hook or entering part to the shape as at E. Now draw the



TWO SPECIAL SHOES FOR THE CORRECTION OF A STRIKER AND A PLAN FOR A TIMBER DOG

back out until it is about $\frac{7}{8}$ inch thick. Next punch a hole the desired size in the end and temper the head. The finished article is shown at F.

Horseshoeing and Horseshoeing Shops in France

The French method of shoeing a horse differs from that in the United States, as two men are invariably required to do the work in France. Blacksmiths in Rouen are familiar with the American method, calling it "à l'anglaise," but never employ it, as they say it is too hard on the chest and back. The shops are often a part of a veterinary establishment. 25 per cent perhaps are owned by veterinaries, and in a part of the shop the veterinary carries on his work. In the country districts the shops are built of wood with no flooring, and in some cases are little better than shacks. The tools vary little from those used in American shops. In Rouen there are no bellows blown by motors, hand labor being used entirely. The bellows are cylinders made of leather, iron bound, fitted with a piston which is worked by a long lever. In country districts they still use the old-fashioned bellows. Nearly all the anvils come from St. Etienne, where they are made in large quantities. They closely resemble American anvils, though they are possibly a trifle larger. The rasp or file is made in England, usually, and does not differ from that used in America. The French method of trimming the hoof differs from the American, as the men use a sharp piece of steel, which they themselves make, without a handle, holding it against the hoof and hitting it with a hammer. They never pare a hoof as do Americans, with the regulation American knife, though they use a very small, somewhat similar one for cutting out corns. The large hammers come from England, usually, and are similar to those used in the United States.

As most of the horses here are heavy draft animals, the shoes required are very heavy and are rarely finished off with a file at the edges. The shoes present a perfectly flat surface to the ground, as no calks, toes or heels are ever used. In winter, in order to prevent slipping, the ordinary shoe nails are withdrawn and

replaced by what are called "clous glace" (nails for ice), which are nails having sharp-pointed ends in place of the ordinary head. Calks for winter use that screw into the shoe and are removable without taking off the shoe have been tried in some cases, but they are not popular and their use is very limited. Some machine-made shoes are seen in the shops, but the blacksmiths state that they are rarely used, as it is a common belief that they do not wear so well, and because, also, they are much harder to work into whatever modifications may be required.

For the hind feet, shoes made of old shoes are always used and are much



MR. WM. W. WATT OF PIETERMARITZBURG, SOUTH AFRICA. HE IS A READER OF "OUR JOURNAL" AND HAS JUST PURCHASED AN AMERICAN BICYCLE

preferred, as they are supposed to last longer. Old shoes are bent in half, another half shoe is placed between the folds, and the three layers are then forged to make half of a new shoe, which is completed by being forged to another half similarly made. For the front feet these are also preferred, but, as the supply is less than the demand, new shoes are more often used. The latter are hand-made from long bars of iron which come from Amiens and cost an average of $1\frac{3}{4}$ cents per pound. Rubber pads are made in Rouen as well as in many cities of France. Nails are manufactured at Duclair, a small village about 20 miles from Rouen, by a Norwegian firm that employs Norwegian workmen exclusively. Their cost retail is $12\frac{1}{3}$ cents per pound, and wholesale, in barrels of 25 kilos, $8\frac{1}{2}$ to $9\frac{1}{2}$ cents per pound.

Horseshoers and blacksmiths in Marseille obtain their supplies from

dealers, most of them being of domestic manufacture. Some nails are of Norwegian make. As a rule the horseshoers buy the iron bars in about 2-meter lengths and cut into the required length for making shoes. The tools are practically the same as those used in the United States with the exception of the file, which in France is provided with a stout wooden handle at one end, and is longer by perhaps 6 or 9 inches than that in use in America. It is claimed that this file with a wooden handle is the more practical of the two, since it lends itself more easily to the farrier than does the shorter one without any grip.

St. Etienne being essentially an industrial town, all material necessary for the blacksmith's trade is found on the spot. The coal comes directly from the mines in the locality. The nails are furnished by two important nail manufacturers in the city, while the iron is chiefly imported from the well-known iron and steel mills of Le Creusot in the Department of the Saone et Loire. Although many of the shoes are made here, some are purchased from Auzin, Department du Nord.

In Bordeaux, horseshoe nails are imported from Bayonne, Basses Pyrenees, and sell at \$12 to \$30 per 100 kilos, according to size. Another principal source of supply is Norway; the nails from this country selling at \$13 to \$32 per 100 kilos. Shoes mechanically forged and stamped from Auzin (Nord) sell at \$6.60 per 100 kilos. Bar iron from Pyrenees, Ariege, and the Perigord sell at \$4 to \$4.60 per 100 kilos. The cost of English bar iron is \$6.60 to \$7.20 per 100 kilos.

All the tools used in Limoges are of French origin. Horseshoeing establishments do no other work than caring for horses, as the work on vehicles is all done in carriage-making establishments. The horseshoes used in this city are all made by hand. It is claimed that these shoes last longer; a better quality of iron being used than in machine-made shoes. Old worn-out shoes and old wheel tires are used by local blacksmiths for making shoes. The nails are of French origin and are purchased from the large domestic manufacturers.

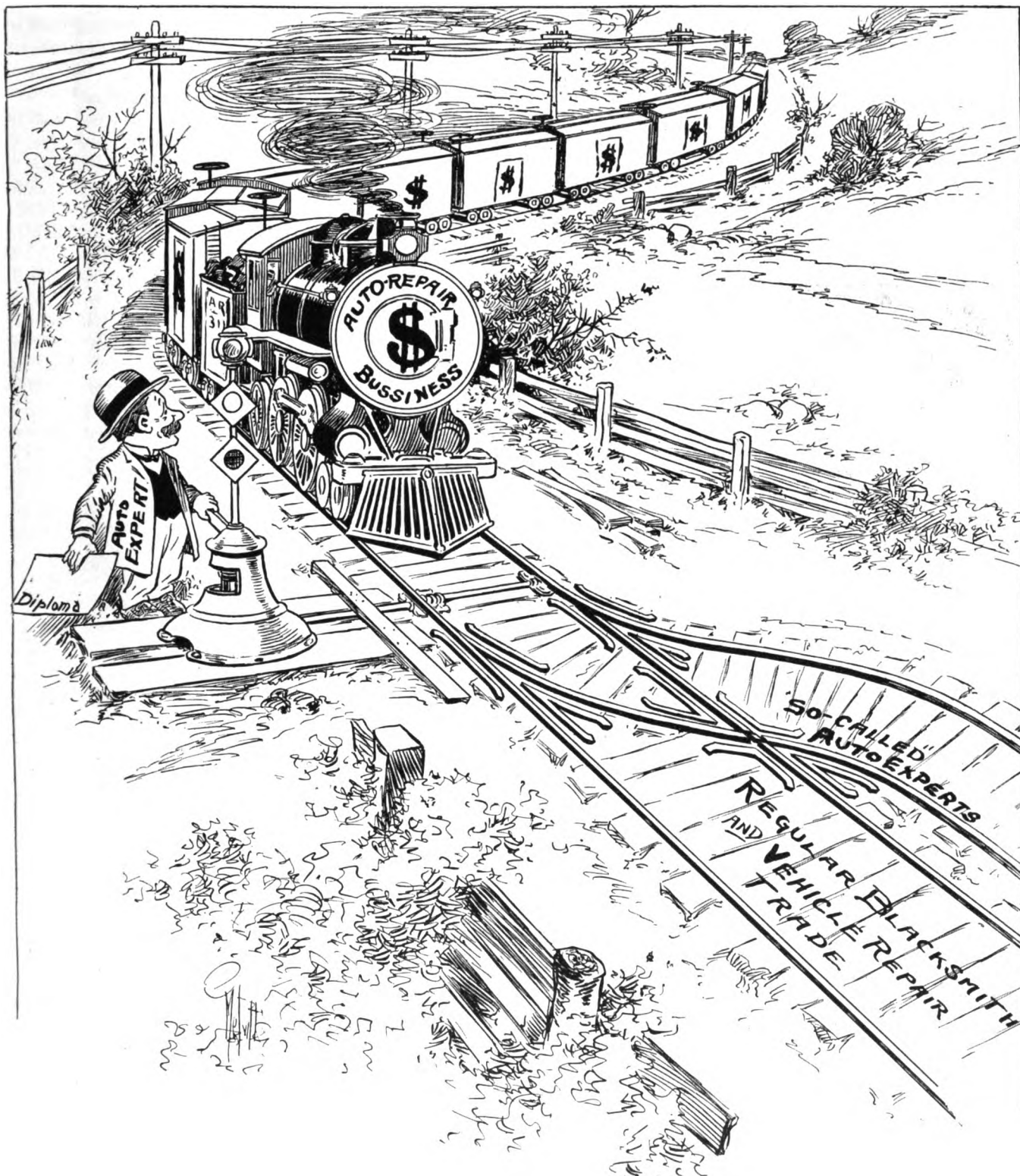
The Creusot iron, which sells at \$5.12 per 100 kilos, and the Marechal iron, or soft steel, at \$4.73 per 100 kilos, are used for making shoes in

THE AMERICAN BLACKSMITH

Lyon. Both of these products come from the Creusot factory located in this district. The nails are manufactured in France from Swedish and

kinds of shoes, springs, and to strengthen the ordinary shoes for horses that wear out shoes rapidly. Nails are hand or machine made.

a flat head. These materials are bought at Nantes, at the iron and hardware dealers. Old engines are much sought after by horseshoers,



With Apologies to Farm Imp. News

DON'T ALLOW THE AUTO EXPERT (?) TO SIDE-TRACK THIS TRAIN OF GOOD BUSINESS

Norwegian iron and are sold at \$13.51 to \$15.44 per 100 kilos.

Only soft iron is used to make shoes at Nantes. Steel that is fairly soft is used to make frost nails, special

There are three kinds of nails: The ordinary nail with a pyramidal head, machine made, also called a white nail; the "charlier" nail, with an oval head; and the English nail, with

who prize such metal highly for horseshoes.

In Paris, blacksmiths do not undertake the repairing of carriages and other miscellaneous services, but

devote their time exclusively to the shoeing of horses. Part of the tools used are manufactured in England, and while some of the tools differ slightly from those employed in England and the United States, it could not be ascertained that radically different or original tools are in use.

Most of the shoes used are manufactured in the Department d'Ardenes which also turns out most of the nails for shoeing horses. The iron used comes from Norway; the coal comes from the northern part of France or from mines in Belgium.



Overhauling An Automobile

Inspecting, Adjusting and Putting the Car in the Best Possible Condition

A. F. HOWARD

When overhauling a car, understand at the outset that it must be a thorough job. There is little sense in making a thorough inspection of one part of the machine and then neglecting some other part. As a chain is no stronger than its weakest link, so an automobile is no better than its weakest point. So make your inspection thorough in all parts of the car. If parts are worn, replace them with new parts; or if not already authorized to do so communicate with the owner and show him just what is needed.

You can secure quite a little of this overhauling work to do during the winter months. Go after this work during your slack time. You can do the work thoroughly, you will have plenty of time (most owners lay up their cars during the heavy

snows) and the work need not interfere at all with regular custom trade.

Start With the Motor

The logical point at which to begin operations is the motor. Examine the valves and regrind them; it being taken for granted that the car has been operated for some little time. The valves may not need much grinding, but it is best to bring them up to highest possible efficiency with the rest of the motor. Then examine the cylinders for carbon deposit. If the deposit is not excessive, perhaps it will not be necessary to take down the cylinders; although if the cylinders cannot be thoroughly cleaned of carbon unless taken apart it will be time well spent to remove the pistons and then to thoroughly remove all carbon deposit. In replacing the pistons examine all adjacent nuts and bolts for looseness, and adjust all bearings properly. Care should be exercised in connection with the valve-regrinding to get the proper valves back into their proper places. For example, do not get the inlet and exhaust valves interchanged, for even if both sets are the same in style it is always best to get a valve back into the seat from which it was removed. Another matter to which careful attention should be given is to insert a cotter pin wherever one belongs and to fasten it.

Before replacing the crank case clean it thoroughly and after replacing it fill with clean fresh oil. Then turn the motor over several times so that all newly cleaned surfaces will be well lubricated before the motor is operated on fuel.

Examine the spark plugs, the battery and magneto and see that all parts are clean and bright. Adjust the gaps on the spark plugs and replace them after spreading a little graphite on the threads.

Don't forget the cooling pump. See that this is in good order and that the coupling by means of which the pump is operated is tight. If any pins or bolts are loose, tighten them up—if worn, replace with new ones.

Now inspect the connections in the fuel, exhaust and cooling systems. If any joints are damaged, put into good order. Cut new gaskets for those connections requiring them and make them carefully.

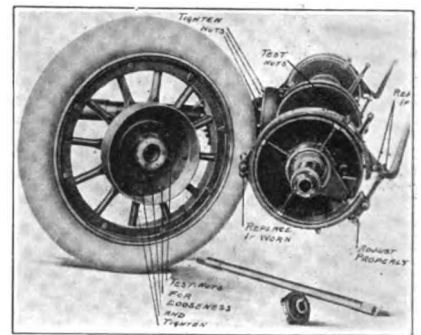
Ignition System

Inspect carefully every part of the ignition system—the wires, the

connections and all. Look for worn insulation, for loose connections, for wires broken inside the insulation and for rusted or dirty connections. Examine the switch and the coil. Brighten up the platinum points on the coil and carefully readjust the vibrators.

Steering Mechanism

To thoroughly inspect the steering mechanism it will be necessary to disconnect all joints, and thus to determine beyond doubt the exact condition of all moving and wearing parts. The steering mechanism is a most important part of the car and too much attention can hardly be paid to it. If any worn parts are uncovered, replace them with new. Adjust reach rods and repack with grease. See that the front wheels are in proper alignment, after adjusting wheel bearings and repacking the hubs with grease.



WINTER IS A GOOD TIME TO SOLICIT OVERHAULING JOBS

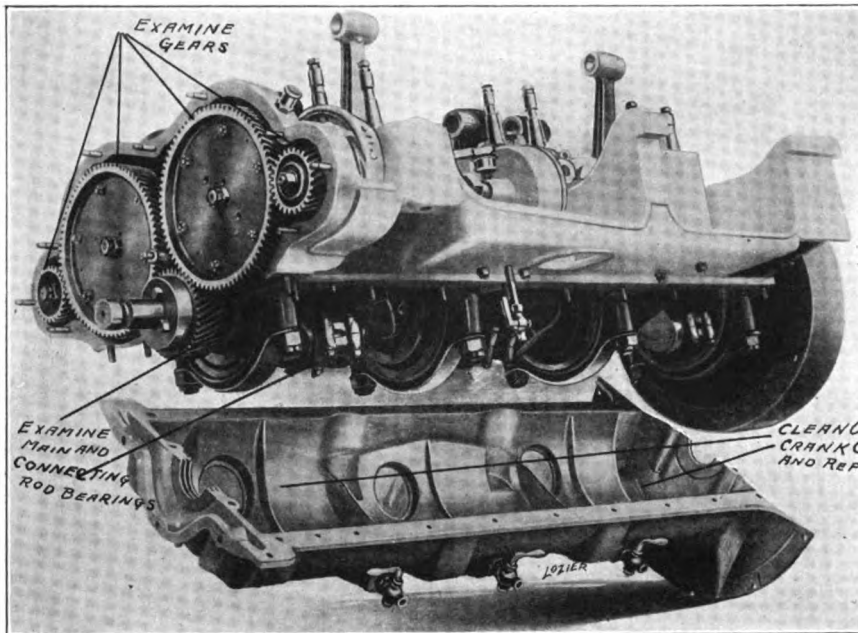
Those connections fitted with leather covers or boots should have their covers cleaned thoroughly and then refilled with fresh grease.

Before leaving the steering mechanism and front part of the car, inspect the springs, cleaning the oil and grease cups and refilling with fresh lubricant. Tighten all spring clips and the nuts on all connecting bolts. If any clips show traces of fracture, replace with new.

The Transmission

We can now inspect the transmission system; and by transmission I include the clutch. If the clutch is of the cone type, examine the lining carefully, and if it has been slipping it is best to fit a new lining. The disc clutch may need cleaning and some adjustment. To clean, remove all the old lubricant and wash with a liberal quantity of kerosene, working the clutch so that the oil will squeeze out all the old

Some time ago I saw in "Our Journal" a letter condemning the divining rod and other machines for water-finding. Since I read his letter I have put the divining rod to a good test. The rod in my hands has never



OVERHAULING MUST BE DONE THOROUGHLY TO BE DONE RIGHT

proved a failure, but I cannot see in what way the divining rod points to water underneath the ground. Can any of our readers tell me the why and wherefore of the rod pointing to water? I have proved that it does, yet I would not advise any man to bore or to sink a well by this method until it is explained how a forked stick can point to water.

Now for the "hoodoo men," as the writer calls them. I have also found them and have been after them with the forked stick in my own hands, and cannot make head or tail of them. Every time the owners have bored at their own cost, and finished with a dry hole. I have heard them say that the water is such a depth, and also how strong. This is impossible for anyone to do. I have also seen them shake all over and the stick has broken off in their hands. This, they say, is due to the very strong water current underneath. I can shake and tremble and break the stick off in my hands and so can any one, and without standing over any water. You take a forked stick, grip it and hold it in one position for any length of time and you will find that the longer you hold it the more it will move and jump, until it finally breaks off, leaving a portion in one hand. But I will guarantee the remaining end won't break off, but will continue to jump about until you let it go.

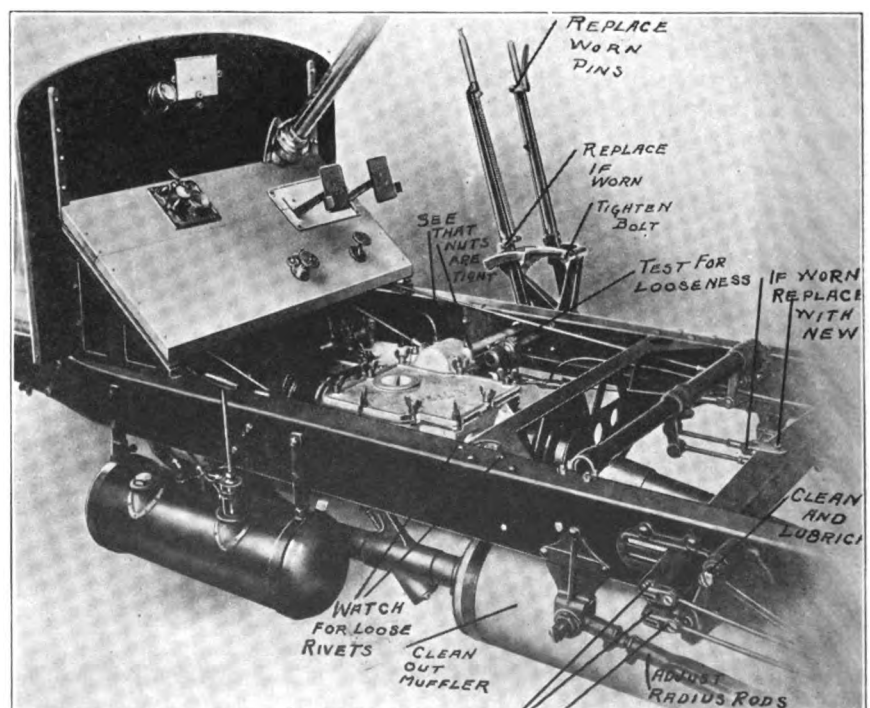
I have also heard people say the divining rod points to minerals. If that is the case, the divining rod

cannot be called a water-finder, but a water and mineral-finder. Therefore, it proves that no man can say whether the rod is pointing to water or minerals. It is a great wonder to me, therefore, that there are no more millionaires in South Africa and other countries, arising from the hoodoo divining rod man.

The writer goes on to say that the best water-finder is the drill. Quite so. But I will point out from personal experience how the drill is not alto-

gether a perfect water-finder. I have also heard people say that one can find water anywhere if he only goes deep enough for it. I will again prove that that is not so. I know of bored holes over 900 feet deep with no water in them. On one particular farm alone there are five bore-holes, ranging from 2 to 500 feet, also a lot of wells sunk, and no water. An old trader was passing through this farm one day and saw the owner there and the water question came up. The old trader told him there was water on his farm if he sank in the right place for it and he would show them. The old trader with the divining rod picked a spot only eight feet from one of the bored holes. The owner laughed at him and said that he had those kind of water-finders before, and none of them were right. However, he sank a well there. When they went down to clean out the hole after the last charge of dynamite, at fourteen feet, to his surprise he landed in three feet of water. That water is standing three feet deep today. It never gets any lower or any higher, and the mill can pump all day and night, day after day, and bring up a full load at every stroke.

Another instance I know is where a man and a herd boy sank a well thirty-five feet deep. It got too deep for the two of them, so he called on a neighbor for help. The neighbor



LOOK AFTER EVERY PART CAREFULLY—A NEGLECTED BOLT MAY CAUSE A SERIOUS ACCIDENT

advised that, as the hole was too small to work in with ease, he should make it two feet larger. They cut down twenty feet of the side, making the hole two feet larger all the way down, and water came gushing out of a hole in the rock about the size of a four-inch pipe. It filled the well to the level of the hole, but it never got any higher. Four hundred head of cattle are watered at this pit daily ever since.

I think I have now proved to the writer of the above-mentioned article how easy it is for the drill to miss. Even sinking by hand isn't sure. And I condemn the divining rod and everything of like nature. Having a good surface formation, put the hole down above a dyke if you can find one and you won't go far wrong.

Stretching the Capital

A. M. BURROUGHS

Study the methods of the banana man and the peanut vender who make a living on \$10 capital

A Northern Indiana furnishing goods concern went out of business a few months ago. When the stock was inventoried some caps were found which were made especially for the Grant-Colfax Presidential Campaign in 1872.

Think of that! Stock forty years old.

The caps cost about 25c each and there were three dozen of them, costing \$9 in all, wholesale.

Charge up a percentage equal to the cost of doing business against that \$9 worth of dead stock for forty years and see what it cost the merchant to keep it on his shelves.

Ask the banana man who stands on the corner how much he could make on that \$9 in forty years in his business. Then you will know what it would have profited this clothing concern had it not kept that stock on the shelves—if it had used the capital right.

The banana man buys a cartload of bananas every morning, costing him about \$9, and sells them before night for \$20.

Since he works every day, holidays and Sundays, he turns his capital every day, 30 times a month.

On a capital of \$9 he does a gross business of more than \$5,000 in the nine months he is able to work.

In forty years he could do a gross business of nearly \$300,000 on that

little capital—without increasing his capital a single penny over that original \$9.

What would he make if he had \$9,000 capital and applied the same principles?

Any wonder the chain store fellows can keep buying more stores and undersell the "good-enough-for-me" one-man store?

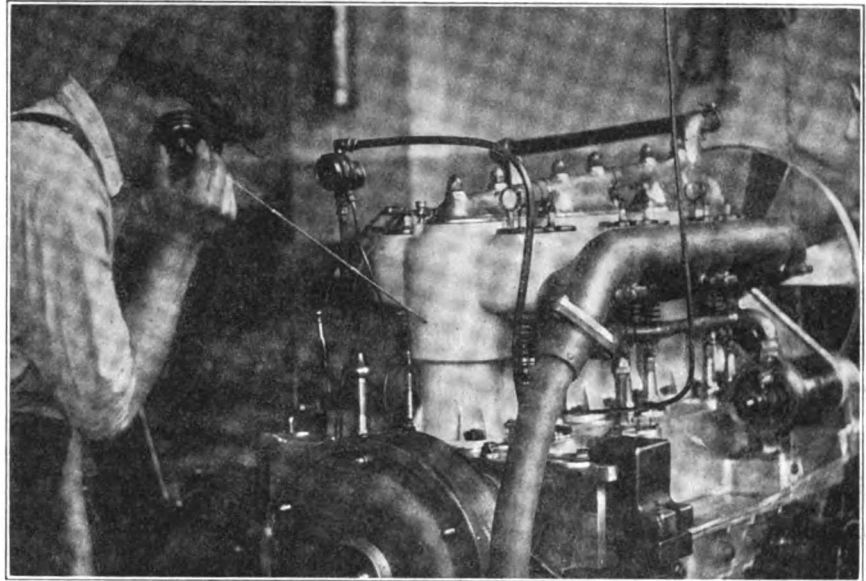
The owner of a chain of six stores has never put a single dollar of his

expenses lower, and the reduced profits on each sale will rapidly multiply into a bigger dividend at the end of the year.

One % profit 52 or 100 times is better than ten % five or six times.

Of course this is possible only by keeping such close tab on sales and purchases that the merchant can buy in very small quantities.

But isn't it better to stand the expense of adequate records and do



TESTING A SIX-CYLINDER MOTOR FOR INTERIOR TROUBLE

The instrument held by the workman is a steel rod in three sections connected to a telephone receiver. By placing the free end of the rod against the side of the motor and putting the ear to the receiver it is possible to locate the source of the smallest disturbance. We are indebted to the Lozier Company for this picture taken in their factory.

own money into the last four stores he opened.

When he opened his second store he began buying in small quantities, stocking up every day and selling the goods before the bills came due.

In a short time he opened his third store without putting any of his own money into it. Soon he increased his chain to six stores.

Now he is doing business almost entirely on the other man's capital. He buys in very small quantities and discounts his bills with the proceeds from the sales of the goods.

If the retailer provides himself with accurate and complete detail information about his sales and his stock on hand he can practically do business entirely on the capital of the houses from which he buys—and make those houses glad to let him do it.

Buying in small quantities may make the cost price a little higher, but the increased sales will make the

a big profitable business on little capital than to worry along without records and do a small unprofitable business on the most capital you can rake and scrape?

(Copyrighted by Burroughs Adding Machine Co.)

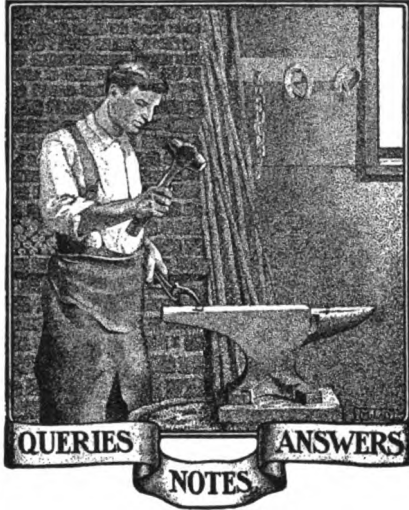
How to Re-Babbit Bearing Boxes

J. M. BERRY

I take the box and lay it on the fire, heating it until all of the grease has burned off, which leaves it as clean as new. I then plunge it in water to wash the smoke and dirt off. While the box is cooling, prepare the shaft. I take common hard bar soap and apply evenly all around the shaft, and very thin (the shaft need not be warm) by running the soap on. Then take something smooth and go over the soap, smoothing it down to insure a smooth bearing. When the box is warm and absolutely dry insert

the shaft and dab up each end around it. Now pour the metal in through the oil hole. Let stand until the metal is thoroughly set, then with your hands twist the shaft out, which is easily done.

Just try this on some old box you have in the shop.



Jobbing House Discrimination.—I read in one of "Our Journals" where a blacksmith said that the jobbing houses that sold to blacksmiths charged them more than they did the hardware stores. This is a fact. Brothers, wake up and take notice, and do not trade with a house that does that.

M. I. MORGAN, Kansas.

Questions on Shoeing.—I must ask you for advice. I have a horse that travels out with her front feet and strikes her ankles. I have tried different kinds of shoeing and cannot stop her. What kind of a shoe is best? Also advise me how to shoe a cock-ankled horse to stop her from laming when she is shod, i. e., how to shoe and the kind of shoe to use. ANTON N. PEOT, Wisconsin.

A Question on Well Drilling.—I would like very much to hear through "Our Journal" if any of our readers have used or seen used the one-man rotary horse drill? Will it cut through hard blue granite or dolomite rock? I fancy it is too light. I am thinking of buying one; hence would like the above information.

F. UNDERDOWN, South Africa.

Likes the Advertising Pages.—I enjoy reading the articles contributed, more especially those that treat on shoeing. The first thing I do when I receive the journal is to peruse its pages for any new or improved machinery that will help me in my work. I use the advertising pages as my business directory and the reading pages as a textbook; taking care to bind my papers as I receive them. You can see, therefore, that if I am not posted and up to date it is my own fault. With my thirty-five years as a practical mechanic I believe I am qualified to say that no smith can afford to be without THE AMERICAN BLACKSMITH.

A. L. JAMES, Texas.

Disk and Shoeing Queries.—I would like to see an article on sharpening disks; also advise me the best cold disk roller and if any users have had trouble in cracking the disks while rolling them.

I also would like to ask the horseshoers how to make a bar shoe, giving full details and cuts of each step.

FRANK SEFCIK, Kansas.

In Reply.—A simple as well as a quick method of forging a bar shoe is to take a shoe, A, with rather long branches. Heat the branches in the fire and turn them over the horn of the anvil, as at B in the engraving, lapping one end over the other. Then reheat the ends, apply a little borax and weld the two ends, forging the bar out, as at C. This gives you a very good bar shoe in two heats and with very little trouble.

After forming the bar, calks and clips may be formed as usual. There is, of course, no need or call for the bar shoe to give frog pressure when the frog already receives plenty of natural pressure. In cases where it is desirable to relieve bearing at the heels the bar shoe will be found excellent. It should be borne in mind, however, that the pressure of the bar shoe must be applied gradually in cases where the frog has dried and hardened from lack of pressure and use.

J. H. BOWEN.

A Tire Setting Kink.—THE AMERICAN BLACKSMITH is the best craft paper in the United States. I enjoy reading every word that is printed in the paper and learn something from every issue.

Now I would like to let some of the boys know of a kink that I use in putting on tires. I have no cold tire setter, as most of my tires are too heavy for cold work. When I get my tires hot and all ready to put on, I paint the tread of the wheel with the heaviest paint I can get, old "skins," etc. Then, when I put my hot tire on, there is no blaze, and I have taken off tires that I have put on that way with 3/4-inch draft and the fellos were not charred the least bit.

G. W. HUGHES, California.

Does Power Pay?—I have been a silent reader of your paper for over a year and think it is a valuable journal for the smith. I have a good shop here; my work consisting of horseshoeing, plow work, tire setting and general wagon and buggy repair work. My income averages about \$1,400 a year, and I have to employ a helper part of the time.

Would like to hear more on the cold tire setter, as I am thinking of putting one in my shop.

I would like to read more letters from the old smiths. Would it pay to install power in my shop to run trip hammer, emery wheel, etc.? M. E. MADDOX, Texas.

Wants Pointers on Track Shoeing.—I have been a reader of "Our Journal" for a long time and I am especially interested in the letters written by the boys on horse-shoeing and other work. In addition to horseshoeing, which is our principal work, we repair wagons and buggies, farm implements and autos. I welded a front spring on an auto last spring and it is running still, although all of the leaves were broken. I took a lap weld and used E. Z. Compound. There is one class of work that is sadly neglected, and that is track shoeing. We

have considerable of that work to do here and I would like to have some brother craftsmen tell how they make the different shoes, their method of brazing the grubbs or calks, etc.; also how they forge rim plates. I would like to know how to make the wedges or where they can be purchased.

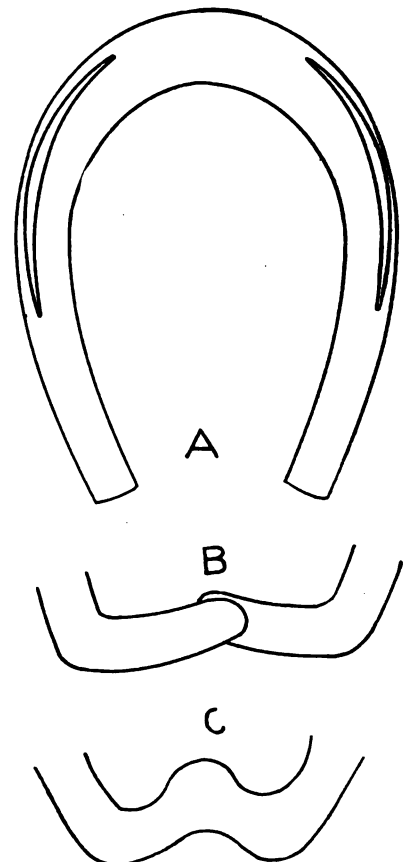
M. A. GRUESBECK, Michigan.

Setting Heavy Tires Cold.—Mr. C. W. Needles claims, in his article on cold tire setting, that there is no cold setter made that will upset the tire smaller than the woodwork. I write this to let him know that he is very much mistaken.

In 1905 a law passed in this county compelling all wagons of a ton or more capacity to carry wide tire from 3 to 3 1/2 inches in size. We knew we would have considerable tire work to do, so we looked about for a cold tire setter to help us. We took one machine on trial, but it did not suit us and we did not buy it. But we did buy a West power tire setter. In 1906 we put on about 150 sets of new tires—about half of them being 3 1/2-inch tires—and most of those 3 1/2-inch tires are still on. Our cold tire setter is all right. We do better work on heavy tires than the horseshoers ever did the old way. The only question is, have you enough tires to set to make it pay?

PHILIP DEUCHLER & SONS, New York.

A New Zealand Letter.—I am living in a small country village and am the only smith here. I have been a resident for fifteen years. We are in close proximity to Mount Egmont, which is a single mountain peak rising to about 9,000 feet with snow on it all the year 'round. It is a beautiful sight in winter, but makes the air very keen. Our climate is not of the best, being



HOW TO MAKE A BAR SHOE

THE AMERICAN BLACKSMITH

a very moist one. This is a great dairying country, with butter factories and cheese factories every few miles. The implements used here for farming are varied. Mostly all the plows are New Zealand made; also the harrows; but the drills for sowing seeds, etc., are from Canada—"The Farmers' Favorite" being the principal one used. My work is practically horseshoeing and general work and the repairing of vehicles. THE AMERICAN BLACKSMITH has proved very beneficial to me. The illustrations are so plain and clear there is no mistaking them. I have gained several ideas and useful recipes which have more than paid me for the price of the papers.

R. J. HANCOCK, New Zealand.

A Canadian Shoeing Shop.—The accompanying engraving shows the interior of my shop where myself and one helper do the best shoeing business in this section. We get better prices than any other shop in this section of the country.

I am glad to get your journal each month and like to read the sensible talks on shoeing. I am not much in the speed line, as I do not believe in fast shoeing. My helper and I average about ten thousand shoes a year, or perhaps a bit better this year, and I find that is all I can do and do it right.

J. K. ARMSTRONG, Ontario.

Mill Picks and Shoeing.—I would like to ask some brother smith if the bath for mill picks in August number would do to temper steam drills or, if not, what other would do? The rock is very hard here. Also I would like to know how much tepid salt added to rain water is necessary to temper cold chisels.

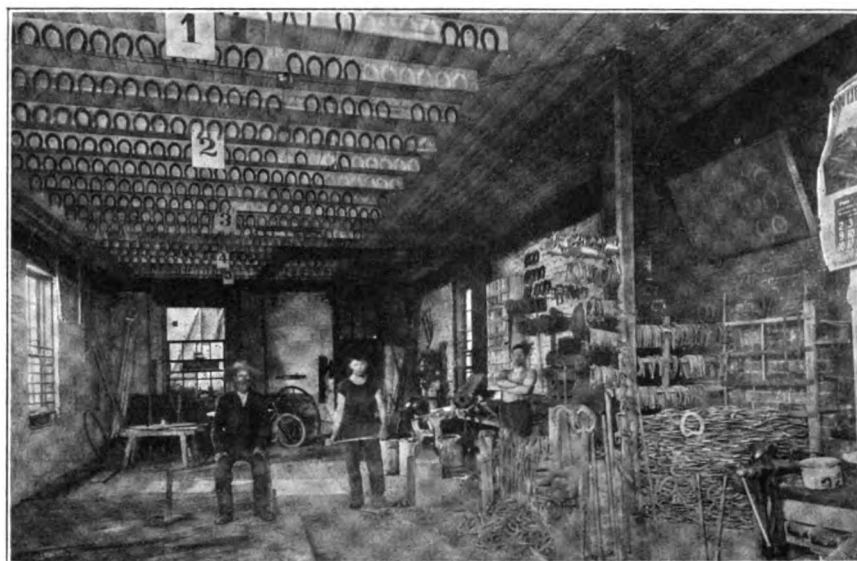
I noticed a question in a recent issue from an amateur as to how to stop a horse from brushing. I have stopped a good many in the following way: I make a hand-made shoe with a feather inside fully three quarters of the length of the inside. I put the nails round the toe and just two nails in the inside. I leave the inside a little higher than the outside and no heel on the outside, but a good bit heavier on the outside than the inside. I often draw the clips one on either side of the toe and one at toe and one at the outside quarter. I have often found a side weight would answer the purpose with a pretty long heel in the inside. When I use a side weight I just double about an inch or so and weld it down, just making it a feather. W. SMITH, New Brunswick.

A Letter from New Zealand.—We do all kinds of work that is usually done in a country shop. We run a cycle agency as a sideline and make all of our own shoes. I have been greatly amused by the arguments for and against hot and cold fitting, but as I have been at the trade only a matter of twenty years I had better not express my opinion, beyond saying that I can make a shoe any shape I want to when it is hot and can do nothing with it when it is cold.

We have a Farriers' Association in Taranaki which is practically only in its infancy; being in existence three years. It is a very difficult matter to get the smiths to leave off fighting one against the other and begin to fight for fair prices and a decent profit. The following is our price list for shoeing. In all cases machine or hand-made shoes are the same price:

	Cash	Credit
Hacks up to 13 in.	5s 6d (\$1.34)	6s (\$1.46)
Harness horses, 13 in. to 15 in.	6s (1.46)	6s 6d (1.58)
Draughts, 15 in.	6s 6d (1.58)	7s (1.70)
overplain	7s 6d (1.82)	8s (1.95)
Draughts, with heels 7s 6d		
Draughts, toes and heels	8s 6d (2.07)	9s (2.19)
Removes, hacks	3s (.73)	3s 6d (.85)
Slippers or old shoes	3s 6d (.85)	4s (.96)
Removes, draughts	4s (.96)	4s 6d (1.08)
Slippers or old shoes 4s 6d	1.08	1.22

Tempering an Anvil.—I have a 190-pound Peter Wright Anvil that I upset last winter. I brought it to a cherry-red and put it in cold water. The water had no salt in it. The anvil is too soft—the hammer easily making an impression in it. I want to know how to temper the anvil until it resists the hammer or, in other words, I want to make



THIS NEATLY KEPT CANADIAN SHOEING SHOP IS RUN BY MR. J. K. ARMSTRONG

the face hard enough without breaking or chipping. H. C. PALMER, Kentucky.

In Reply.—While you used clear water in your tempering bath, salt brine would have been very much better; although we do not think that failure to use salt brine was responsible for the soft face on the anvil. We believe your difficulty was in not agitating the water in the vicinity of the anvil face while immersing in the bath. This is an important factor; as you can readily understand that the hot face of the anvil coming in contact with the water would generate steam, and unless this steam is dispersed and clear cold water is allowed to come in constant contact with the metal the face cannot be properly tempered. To temper the face of the anvil properly we would suggest your using a strong salt brine for the bath, and to have one or two paddles handy so that the water can be thoroughly agitated while the anvil is immersed in the bath.

Smithing Conditions in Transvaal.—I served my time in one of the old-time country blacksmith shops in the Old Country where we were called upon to repair everything from a needle to a steam engine. I have just completed twenty years at the trade, the greater part of my time at the shoeing forge. I have shod in competition and have brought away the colors. My last billet was 9½ years, but thinking I could better myself I gave it up and proceeded to the Transvaal. I got off the train at Randfontein Gold Mines to try the workshops. I arrived in a bad season, everything was quiet, but I had a good look around the workshops. To my disgust and surprise as a white tradesman I saw that they are employing and teaching the natives the trade, using them as strikers, etc. While there I met not one honest working white tradesman, but dozens of them looking for employment, and could not get even a striker's job. Of course I met men that were looking for work, but praying the whole time that they would not get it. These can be found in any country. One requires very little experience to pick them out—these Tom

Tardy men. I visited every shop I heard of, from Randfontein to the Premier Mine, and finally landed back in Pretoria. In every shop the natives have pushed the white man out. At one particular shop in Pretoria the owner actually boasted to me how he had taught a Kaffir the trade and secured him a situation as floorman in one of the

best shops in Johannesburg. At another shop in Pretoria where I called seeking employment the owner told me that the white tradesman would not be wanted at all in a very short time.

They are also cutting prices all 'round. For instance, in Pretoria they are shoeing for 4s 6d (\$1.09) a set. How can we pay white labor at that price? You know the kind of people we have in Africa; they don't care how a job is done so long as they can get out of paying a fair price for it. Botchers are what are wanted in Africa. There is no work for a good tradesman.

Now a great many of our readers, especially in the Old Country where they know very little or nothing about the Colonies, will think that I am trying to sit on the native of South Africa. I say, no! If a man with a colored skin can do as good a job as a white man, pay him a fair wage and keep the prices up. Now the way the native lives in Africa it costs him from 10s (\$2.43) to £1 (\$4.87) a month. I know, for I have three natives working for me. I order their goods and pay for it, deducting from their pay at the end of each month. It never goes above ten shillings a head. Can a white man live for that?

In conclusion I wish to say that until the natives of Africa can act and live up to the standard of the white man his place is not in the workshops of the father of all trades in the world. The cry after the Boer War was that South Africa was going to be a white man's country. This is the way our glorious nation has commenced to make it that; trying to ram into the raw heathen in 100 years what it took the nation 1000 years to do—learn civilization.

The above is my experience. Other parts of the country may be different, but I doubt it. I hope to get a few hints from our South African Brothers on this subject. I have heard said during my unemployed tour that it was only a Kaffir's work to knock off shoes, sweep and tidy up the shop. Do they get a Kaffir to do this in the Old Country? No! Neither do they get one to run and pick up hammers, etc., for them. I heartily say that an apprentice who thinks himself

THE AMERICAN BLACKSMITH

above sweeping out is not fit to be a member of the trade. This is from actual experience; and if any of our South African Brothers question it through our valuable journal I can still rub it in straight from the shoulder as a member of the shoeing branch which I have now had to give up in

some people who object to your being not of their own nationality or opinion or who object to your independence or prices and take an opportunity when they think they might beat you down. Now my experience is that this injustice does not hurt you until you worry about it. I had an assistant,

had from all over the country; of which the very best one, and only good character, was the one written by myself.

Of course, when my creditors saw that all the people went to the new shop and got the work done for nearly half price, they asked me what I intended to do. Knowing the man's character I felt I could beat him in the end, but I intended to do nothing until he would be exhausted; then I would start again. They said that they did not consider character such a great factor in business, but they would not rush me for the money if I really intended to stick.

I did not worry in the least about the opposition, but made a cart or a wagon now and then, having only a rough native helper, and as soon as I had one finished some buyer came and I started another, having no other orders on hand. I kept up in this way for twelve months. I lost heavily of my stock from the shop and shed, but could not trace the thief. Then some old customers came with little jobs and the opposition got very much upset about it. He told them he would not do anything for them if they took some jobs to me. He then sent in his accounts and requested payment at once. Hearing of this I knew how things were standing. I treated the old customers with new politeness and one after the other came back.

I then went to a lawyer and asked him to take action against the party for defamation of character, which had been going on ever since. He advised me, however, to wait until he had spoken to the man, for he was afraid that his credit was about overdrawn.

The two men that worked for him came to me asking for employment, and so I started again and he had no helper. He suddenly left town and has never returned. His creditors soon came to me and asked me to buy the whole equipment, which I



THIS UP-TO-DATE CONCRETE SHOP IS RUN BY MR. J. F. BERRY, OF ILLINOIS. IT IS EQUIPPED WITH THE LATEST MACHINERY, AND MR. BERRY SELLS BUGGIES, WAGONS AND FARM TRUCKS

disgust of my brother tradesmen of South Africa. F. UNDERDOWN, South Africa.

Meeting Competition in Natal.—I was just reading in the July number Mr. Thornton's ways of meeting competition, which I am afraid would not always act well. I should like to give some of my own experience.

If a farmer comes to me and says that he cannot pay for a new cart, or for having his wagon done up, but he would be able to do it if I could just make him the wheels and the irons and supply the timber I certainly do so with the greatest pleasure. I work out a plan for him if he has not made his own plan and cut all the timber to the size required. I tell him the easiest way, with the intention of really helping the man along. And I get paid for the little he can afford, instead of telling him that I could make the job much better than he could, and turn it out as cheap as possible, and then wait a year or two to get the money.

Or another comes and says that if he had a forge and bellows or a drill he would not have to run in such a long distance and stop work until the job is finished, perhaps for days. I sell him the implements which I can spare, or if I know of better tools in which I would like to invest I sell him the old ones. I order new tools for him if he wishes. He respects me more for it and he sees that I do not mean to live on his misfortune and at his loss. Then when he realizes what time and material he is wasting in a busy season he will give you the job; or he may show his confidence and gratitude by asking you to inspect all his tools and vehicles at your convenience and make the necessary repairs, as he would only try to repair breakdowns occasionally. I tell them also, and mean it too, that I am very glad they can help themselves with little repairing and I only wish to do that which they cannot do on the farm.

By meeting competition this way one grows out of narrow mindedness, worries and jealousies, and your neighbors will increase your business continually if they can rely on your generous thought and action.

I also beg to give you an experience in meeting unfair opposition, which may be of assistance to some brother in the same trouble. No matter who you are you cannot please everybody. There are sure to be

a good tradesman he was, and in bodily strength far my superior. He was quite a sportsman and booked in on all the races, but paid very little consideration to honesty and character. He got money advanced, and started up in the same village, although there were splendid opportunities in other localities (which have since been filled). I heard of his intention, but did not believe it true, because the place could not support two shops. He borrowed my bicycle and went from farm to farm blackguarding me



THE SHOER AND IMPLEMENT REPAIRMAN HELP THE FARMER FEED THE WORLD

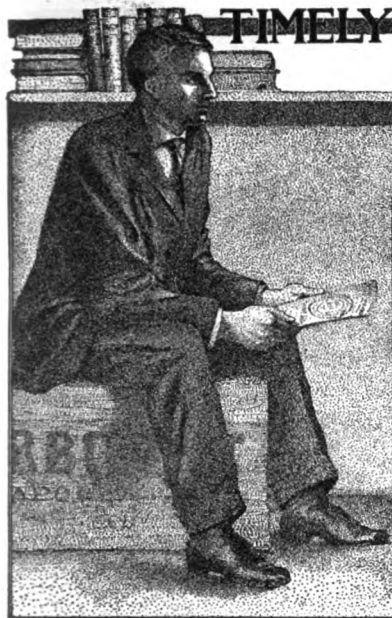
right and left. I had not been long in the place then and people did not sympathize with me when they were told that I could not shoe a horse right, could not make proper wheels or put on tires and the like. He said that he had been asked by everybody to put up a good shop, being a first-class tradesman, and turn out the work at half my prices, boasting of references he

did at my own price. This has caused me very little trouble, but I have learned a great deal and am not at all sorry for the experience.

My sideline in spare time is electric bell fitting, which is quite a novelty here. I study technical books of all lines and do all kinds of engineering and plumbing.

OTTO TIETZ, South Africa.

TIMELY TALKS WITH OUR SUBSCRIBERS



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Christmas Every Month

As a medium for extending Christmas Greetings and Wishes to the practical blacksmith, horseshoer or vehicle worker, there is not another thing on God's green earth that can compare with THE AMERICAN BLACKSMITH. We quote from a letter received from Mr. J. C. Ordung of Indiana: "THE AMERICAN BLACKSMITH was sent me a year ago as a Christmas present. I consider that I have received twelve presents instead of one—Christmas every month."

That is how THE AMERICAN BLACKSMITH carries Christmas cheer. If you have a friend or acquaintance in any branch of the smithing trade, why not back up your greetings for a "Merry Christmas" by presenting him with a year's subscription to THE AMERICAN BLACKSMITH.

Have You Ordered Your Calendars?

We still have a few of those handsome 1913 calendars. If you have not yet ordered yours, you can still secure a small lot if you will get your order in immediately. Surely you have sixty or a hundred customers whom you consider worth spending a few cents on. The calendar will do more towards securing a larger proportion of a customer's business than any other advertising medium. A calendar presented to the man whom you want as a customer will do more toward getting him started toward your shop than a whole bushel of circulars.

A worth-having calendar that is worth keeping "is on the job" every one of the 365 days of the year. It carries your business card right into the places where the need for your services and your work originates. And certainly THE AMERICAN BLACKSMITH calendar for 1913 is a worth-having calendar that is worth keeping, and one that you will be proud to call your own.

Send your order in NOW, right away—it will pay you to lay this paper aside for a minute and get your order to us without another second's delay.

A New Series

This month we introduce a new contributor to our columns, Mr. A. C. Gough. His series of articles will be different from any that have yet appeared in "Our Journal". Mr. Gough's specialty is machines of new designs and features. He will suggest new machines for the general shop—old machines of new design and machines of special design to save time, labor and money. We believe that this new series will be of considerable value and interest to every reader of "Our Journal."

Contents, December, 1912

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New Friends and Old

When a blacksmith has read a paper for any length of time he should be competent to judge of its practical worth. And when a practical blacksmith has read but a few issues of that same paper and recommends that paper you must agree that that publication must be a worthy one.

In support of the above, just read these letters:

"I enclose check for THE AMERICAN BLACKSMITH. I take two other blacksmith publications, but I find many things of interest to the craft in THE AMERICAN BLACKSMITH that I don't find in the others. I have worked at the business for forty years and find there is much yet to learn." C. F. D. FAYERWEATHER, Rhode Island.

"I can honestly tell you that although I have only been taking the paper for twelve months I have received pounds' worth of information; not to mention the confidence it has given me in the craft and in your work in particular."

D. R. WINTON, New South Wales, Aus.

And the paper of which both these men speak so highly is THE AMERICAN BLACKSMITH. Surely a publication that thoroughly meets the needs of both the newcomer and the veteran must be a paper in which every practical blacksmith can put his faith.

A Guarantee

The little Pink Buffalo Stamps stand behind the man behind the anvil. And the publishers of "Our Journal" stand behind every Pink Buffalo Stamp. The Pink Stamps insist upon your receiving a fair and square deal in every transaction you have with a dealer or manufacturer in blacksmith supplies and equipment. Use these stamps freely on your letters to manufacturers and dealers with whom you do business. Let them know that THE AMERICAN BLACKSMITH COMPANY insists upon your securing a square deal. The Pink Stamp on your letter lets the manufacturer or dealer know that THE AMERICAN BLACKSMITH will protect you and support you if you don't secure a square deal.

And our "Honest Dealings" Paragraph insures you, and guarantees the reliability of those firms who advertise in the columns of THE AMERICAN BLACKSMITH.

"Honest Dealings" and the Pink Stamps work hand in hand for the protection of "Our Folks." If your supply of Pink Stamps is low, ask for more immediately. Don't ever allow a single letter to go to a manufacturer, dealer or brother smith without a Pink Stamp on it.



1.



2.



3.



4.

Apologies to Farm Imp. News

ARE YOU USING THE CLUBS WE GIVE YOU TO CHASE THAT FAILURE BUG-A-BOO BACK TO THE WOODS?

A Simple System of Accounting, for the Smith-Shop

J. R. JENNINGS

THE smith who does not keep an accurate daily record of his business cannot know what he or his business is doing. And if no daily records are kept, certainly weekly, monthly and yearly records are impossible.

Without records you cannot find the leaks, and if you cannot find the leaks you cannot stop them up; and when you cannot stop the leaks, profit—real money that really belongs to you—is getting away from you and going where you cannot reclaim it.

Now as for some simple system for keeping track of business:

First of all we must have or at least should have some means of keeping tabs on the cash that is taken in. Some smiths say: "Why keep track of cash? I put it in my pocket—the job goes out and that's all there is to it! Why add any red tape to the cash end of the business?"

Suppose, however, we are keeping strict account of the cash jobs. We put down the kind of work, the cash taken in, and in a few seconds have made a record that we can refer to for years if necessary. At the end of the day, by glancing over the day's record, we know what stock we have used, the amount of cash taken in, and we can figure pretty closely on the profit or loss we have made that day.

And right here we may mention another advantage of the cash record. If a start is made with a complete inventory as a basis it is easy to keep daily account of just the stock on hand—to keep as it were a perpetual inventory and stock record.

So keep account of the cash business; if you have nothing more than an ordinary sheet of paper put down a memorandum of the job

and the amount received for it; and at the day's close see that the cash actually taken in corresponds to the record kept of it.

To keep a record of credit business, expenses, costs and all other matters pertaining to the business, a set of books is probably the best suited to the needs of the blacksmith. There should be a daybook, a book in which to keep a record of expenses, a ledger and an inventory record. If the business is a small one, the

All transactions for one day should be entered under one date—it is best to start a new page for each new day. When a customer pays a bill, or pays anything on account, enter the transaction in the day-book.

At the end of the day enter the various items in the ledger under the respective customer's names. The ledger should be divided into customers' accounts—the customer's name at the top of the page, and

August, 20, 1912

<i>Dilscher</i>			
2	<i>new shoes on Jud</i>		80
2	<i>reset Jud</i>		40
		1	20
<i>Al Harding</i>			
4	<i>new shoes - Bay mare</i>	1	60
1	<i>pail axle grease</i>		50
		2	10
<i>Botting</i>			
	<i>Repair sickle bar</i>	1	25
<i>Redding</i>			
	<i>Repair 3-horse runner</i>		75
1	<i>tool</i>		50

A SHEET FROM THE DAYBOOK

ledger and the daybook may be combined in one. This will be explained later.

The daybook may be of ordinary cheap manilla paper—about 6 inches by 12 inches in size. In this a careful record is kept of every transaction. When a customer has a horse shod, write the customer's name, then the work done, the name of the horse and the amount of the job.

then entries of his various business transactions; showing the dates, the work done, the amounts paid on account and the total amount of his account at each month's end.

If the business is small, or there are but few departments, the day-book and ledger may be combined; that is, ledger accounts only may be kept. Thus, when Jones comes in to have his horse shod, the entry

THE AMERICAN BLACKSMITH

John Redding
Indian Rd. - R. 7. D. #3 from Lehigh

1912						
Jan	6	Repairs & Indel	14	4	75	
	15	Repairs	40	6	50	
	20	shoring	56	3	20	
	22	shoring	78	4	80	
	28	Indel.	118	1	00	
	30	Indel	130	2	25	
				22	50	3
Feb.	8	On account	171			20 00
	8	Repairs	171	2	50	
	19	On acct.	219	4	35	2 50
	19	Indel.	219	3	36	
	22	shoring & Indel	226	4	50	
	26	Repairs	234	11	85	
	28	shoring	241	1	20	
				27	76	2 50
Mar.	10	On acct.	273	25	26	25 26

HOW AN ACCOUNT IS POSTED IN THE LEDGER

may be made directly in the ledger. However, if the business is of any considerable size, or there are any number of departments and consequently many different lines of work, it is best to have both a day-book and a ledger.

The expense record book is the book which tells you how much it costs you to do business. In it should be kept strict, careful and accurate account of every day's expense. For only by keeping track of expenses can you hope to get an accurate idea of real profits or losses. And, if you have any doubts on the subject, keep an expense record book carefully and accurately for a year. Figure your expenses and costs for that year and stand them up against the amount showing the volume of business. You will probably find that instead of a 15 or 20% profit, or whatever you THOUGHT you were making, your books will show that you have made very much less or even suffered a loss.

In this expense record should be entered each and every item that goes to make up the cost of doing business: Salaries, including the proprietor's; rent; taxes; interest on investment; light; fuel; insurance; advertising; uncollected debts

plus the cost of attempted collecting; allowances and discounts to customers; telephone; water and any other items that rightly belong to business expense. Don't fail to enter an expense item because of its small amount, or forget one item because of its size. The two-cent stamp used to carry a bill to a customer is an item of business expense; so is the one cent paid for a postcard with which you advise a customer that his wagon is finished.

The inventory record, if a smith is a practical, systematic man, may be kept right up to date. For example, suppose he start—as he, of course, should—with a complete record of stock, equipment and fittings—

a daily record of jobs and work done will tell him what is used or sold each day. A simple entry or series of entries each day will show just what remains of each part of the stock. Another advantage—and by no means a small one—is the fact that instead of looking over stock to see what is needed, the book will show just what stocks are low. When the jobber's salesman calls, you don't need to look over your stock—a glance at your inventory record will tell you what you lack.

The inventory record should show, first a list of the shop equipment—the machines and tools used in carrying on the business; the names of the manufacturers; the maker's numbers of such machines as are identified by number and the price paid for each tool and machine.

The writer has reproduced a page from each of his books to show just how this system works out. In the sample page from the daybook, under date of August 20th, we find that "Dilscher" had two new shoes put on a horse named "Jud," also two shoes reset on the same animal—total being \$1.20. The next entry shows that Al. Harding had four new shoes put on a bay mare and that he also purchased a pail of axle grease—both amounting to \$2.10; and so on—the daybook showing the business transactions carried on each day.

From the daybook, the business is posted in the ledger under the respective customer's account, as shown in the sample page from the account of John Redding. At the top of the ledger page is the customer's name, his address and his postoffice address. During January this customer's business amounted to \$22.50. On February 3rd a statement was sent to him, as per the check mark and the figure 3

August - 1912

1	25 stamps	50
1	10 post cards	10
2	Cigars for office	2 50
2	Telephone	3 00
2	gas	1 10
3	Salaries	78 50
3	rent	32 00

THE EXPENSE BOOKS TELL YOU WHAT IT COSTS TO DO BUSINESS

at the right of the month's business. On February 8th he paid \$20.00 on account and also got repair work to the amount of \$2.50; and so the daybook entries are posted in the ledger: The date being put in the first columns, then the kind of work done, then the page number upon which the item may be found in the daybook, and last the amount of the business.

In order to keep tab on the bills sent to customers, make a check mark at the right of the amount for which the customer is billed and in the check mark put the date upon which the bill was sent.

A trial of this simple system will tell you so much that you should know about your business that you'll not want to discard it after once giving it a thorough trial; and after you have run your business on a system of this kind you'll wonder how some smiths can do any business at all and live, by keeping track of accounts on a slate or on scraps of paper which are everywhere but where they should be when wanted.

Getting the Customer's Note

R. H. BECKER

Here is a method of collecting which the implement dealer uses, but which the average blacksmith seldom if ever employs. When a customer does business with you, let there be some definite understanding as to payment. It is better to know before you turn the work over to the customer that you can count on your pay in sixty days than to find out after six days that you will very likely never get the money.

So keep a few note blanks on hand. When a customer says: "I'll pay you next month," he may mean it or he may not mean it.

If you ask him: "What date next month," he will probably reply: "Oh, around the 10th or 15th." Then is the time to pin him down. Get back at him about like this:

"Well, that will be fine! I've got a big bill for stock to meet on the 10th, and if I can count on something definite it will help me out. Of course, everyone knows your credit is good as gold, so if you will just sign this note I'll make the time right and that will enable me to meet my obligations."

A good strong talk along this line will usually get you what you want. And the customer cannot consistently refuse without appearing as unwilling to pay the account when due.

When you get a note, take it to your bank—they will tell you what you can do with it, if you don't know.

Some Letters That Have Brought In the Cash

J. C. WALLACE

Success in any business doesn't simply mean goods sold, services in demand, time well occupied. It

First, of course, a bill or statement is sent to the customer. This should be sent to him on the first of the month succeeding the delivery of the job or jobs.

If the customer doesn't come in by the 10th or 15th, at the latest, drop him a line. Certainly, unless some definite arrangement was made for longer credit, the customer should either pay by the 15th or explain why he cannot pay at that time. So write the customer a courteous note, not later than the 16th of the month. Call attention to your account, and that it is due. Incidentally call attention to some new machine, new man or new stock

No. _____	Burns, Mass., _____ 190
Due _____	
_____ after date _____ promise	
to pay at the Security Bank of Burns, to the order of _____	
\$ _____ 100 _____ dollars,	
value received. _____	

LET THERE BE SOME DEFINITE UNDERSTANDING AS TO PAYMENT

means customers satisfied. It means complaints handled satisfactorily. It means bills paid outside of court.

It is one thing to do work for a man or to sell him something, but it is quite another thing to get him to give up something that he wants. But the man who wishes to be a successful smith must do both these things, and he must do both of them well. He must first get the work to do and then the cash for which he did it.

And in trying to get the money after the work is done it is well to always bear in mind one thing. It is this: The debt is a just one, a strict business obligation, and you are justly entitled to the money—not because you need the money; not because you must "meet a big bill next week"; not because you are hard up—BUT BECAUSE YOU DID THE WORK AND ARE ENTITLED TO YOUR PAY.

Do you see the point?

Now that you have the right point of view, let us consider a series of collection letters for the use of a general blacksmith.

you've just gotten, invite him to call and see for himself, and endeavor to show him that you consider him a friend of the business.

Here's an example of such a letter:

Dear Sir: In the rush of harvest hurry I trust that you have not overlooked my bill. I know you have been busy, but I feel, too, that all you need is a little reminder. Kindly come in and see me—or if you will not be into town this week send me a check.

When you do come to town I want you to be sure and see my new disk sharpener. I've just installed it. If you come in soon we'll probably have some disks on hand to show you just how good a job it turns out. That disk sharpener has been busy almost every minute since we have set it up. Better come in and see it operate.

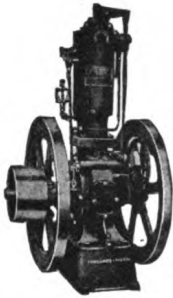
The second letter, if no reply is received to the first one, should be a little more urgent. If the customer is generally considered good pay write him something like this:

Dear Sir: I am quite surprised not to have heard from you before this with some reference to my bill. It is now considerably past the usual limit, and I feel that I deserve some word from you in regard to this account.

I haven't seen you in the shop lately—isn't it near time to shoe one of your good horses? It isn't well to let them go too long without at least a resetting.

The above letter may follow the first one after about ten days. However, if the customer's record shows that he is probably ignoring your request for payment write him along this line:

Dear Sir: I haven't had the pleasure of receiving even a postcard in reply to my letter of the 16th. This bill is now



SEE IT RUN

Come in and see my new engine—see it pull all my machines at once with power left to operate the pump at the water trough. An operating agency for this engine enables me to tell you all about it and to sell you one at about the same price you would pay for a poor engine. Let me tell you all about it—show you the good points and help you look for bad points.

R. J. BRANTLEY
POST OFFICE SQUARE

**THE RIGHT IDEA—INVITE THEM
TO SEE YOUR ENGINE**

considerably overdue. Kindly send me a check. My price on the work done was on the basis of payment being made when due. I trust that you see the advisability of giving this matter your immediate attention.

After the second letter it is best to devote all attention to the collection of the bill, without any reference to the shop or new equipment. And it is well also to remember that a long winded, long drawn out request for payment loses strength with every additional letter sent to the customer. So it is best to make your third and fourth letters short, courteous, but right to the point.

Here is a third letter that has brought in many a dollar that number two failed to touch at all:

Dear Sir: When I do work of any kind I do it as well as I can and at a price consistent with the work and prompt payment. I have sent you two requests for payment of my bill which is now long overdue. I must insist upon this account being paid not later than——

The fourth letter, when necessary, must usually be followed by a trip to your lawyer's. For I find that the average account that runs until the fourth letter is necessary is usually a bill that the lawyer will have to collect.

This letter is number four, and one written just before the account is turned over to a lawyer.

Dear Sir: I have made three requests for payment of the enclosed bill. Up to the present time I have failed to receive either a payment or an explanation for non-payment from you. Under the circumstances, can I conclude otherwise than that you desire to ignore my requests?

I cannot carry this bill any longer. If it is not paid by —— it will be necessary to place it in the hands of my lawyer without further notice.

From this stage the account had best be turned over to a lawyer and such steps taken as seem necessary in order to get the money that belongs to you.

A Blessing in Disguise

How a Misfortune Opened a
Smith's Eyes

Several years ago the owner of a growing general blacksmithing business in a large western city was taken ill. He had a good business, good men employed and an exceptional man working for him as foreman, who took charge of the business while the owner was sick. His illness lasted several months—he had worked so hard and so close to his business that recovery was slow, because his strength had been sapped.

At times it looked as if he would have to give up the business entirely. Then again he would rally as though nothing could keep him from immediate recovery. After awhile his old strength came back, slowly, very slowly at first, and then, as he was able to sit out of doors, more rapidly, until he thought himself amply strong to get back into the harness. The doctor, however, suggested a short trip, which he took, and being interested in blacksmithing he naturally visited several shops, talked to the proprietors and did considerable thinking.

After awhile he came home and visited his shop. The business was still good; it had been managed better than he expected; the profits were there, but somehow the business was not the same. It looked differently to him. An absence had turned him into an observer of his business. He had lived and

worked too close to his business. For weeks his illness had made it impossible for him to keep in close touch with the shop, and now that his health was again good he looked upon the business almost as a stranger.

He made some big changes; unnecessary and useless things were "cut out"; new machines were put in and arranged more conveniently; new "side-lines" were put in; the spaces devoted to two departments were rearranged and made smaller, to accommodate an automobile department; "side-lines" that were not paying the profit they should were discontinued; the investment in many departments was reduced, so that money in those departments could be turned over oftener and quicker.

For example; instead of buying a big stock of paints that would last him, with few purchases between seasons, for a year; he allowed the paint house in his town to carry his stock for him—that is he purchased only such paints, colors and varnishes as he needed from time

A Blind Horse

can work, but one without feet cannot. A horse's usefulness depends upon his feet. If his feet are poor, the horse is poor. It is the horse-shoer's business to keep the horse's feet good. If your horse has poor or diseased feet, bring him to my shop. Most folks say I am a good shoer of horses. I specialize on diseased feet. I want to show you—will you bring in your horse?

JOHN PRICE
Practical Horseshoer
WATER STREET

**TALK PERSISTENTLY AND THEY'LL
COME TO YOUR SHOP**

to time. This reduced his investment in the paint department and enabled him to give his customers any colors or combination of colors; not limiting them to his stock, as previously.

In the horseshoeing end of the business, instead of carrying a six or twelve months' supply of shoes he carries only enough to meet his

needs from month to month. Here again the jobber in his city carries his stock for him, as it were, enabling him to turn his money over twelve

A HORSE IS WORTHLESS

unless he is shod correctly. To shoe a horse correctly, a shoer must have experience and knowledge. I have studied shoeing for twenty years—I ought to know something about it, and I do. But I don't know it all—in fact never expect to. You see there is so much to shoeing horses correctly that a man doesn't live long enough to learn it all. That's why you cannot afford to have an inexperienced man to work on your horses.

JOHN PRICE
Practical Horseshoer
WATER STREET

GOOD ADVERTISING BACKED BY
GOOD WORK WILL WIN
EVERY TIME

times, as against twice, in the past.

And thus did this smith reduce his investment, stretch his capital and increase his profit.

He also learned that he would be worth more to his business if he did not work quite so close to it. He now does more planning than actual smith-shop work; and needless to say he is looked upon as a pretty successful blacksmith.

Most smiths are so close to their own business that they are poor judges of what ought to be done. They feel that because of their familiarity with their business—because of their intimate knowledge of their problems—that they have done their utmost to solve them. The average smith thinks that he has worked and labored night and day to solve his business difficulties, and because he does not seem to get anywhere he blames the business. Whereas, had he worked wisely during the day only, he would soon gain just as the smith in the foregoing has gained.

What Blacksmiths Are Doing to Advertise Their Shops

Advertising like smithing has its kinks. All that pretends to be ad-

vertising isn't advertising any more than all work done on the anvil is smithing. Some of it is botching.

Friend Brantley we believe has the right idea in his "See It Run" advertisement. His ad as a whole is good. The idea of inviting customers to come in to "See It Run" is excellent. We doubt, however, the wisdom of saying "and to sell you one at about the same price you would pay for a poor engine." This phrase and idea could be expressed a little better we believe by saying: "As a practical operator I can tell you all about this engine, and being an operating agent can deliver a first-class engine at about the price usually paid for an ordinary engine." That "help you look for the bad points" appeals to us. It has a tendency to put the reader of the ad in the proper frame of mind.

The "John Price" ads—two of which are shown—are excellent examples of their kind. That kind of talk kept persistently before the folks you want as customers cannot help but bring in the trade. Mr.

Price says he uses the same ads on postcards, and has built up a good reputation on shoeing in just this way. Of course he had to make the work back up his statements.

And that brings us to a realization of the futility of advertising things and statements that you cannot back up good and strong. It is poor policy to say anything you don't mean. Don't say you'll supply a certain kind of repair or work of a certain grade unless you will and can.

Bellingham Brothers carry out their ideas right along this line. Their ad is good, except for the general statements which they make. Their introduction is good. The "Plow Work" item is good. The "Auto Work" item is not good. Something more specific under this head would make this much stronger. The mention of the doctors as reference is very good, but it would be better to tell about what kind of work was done rather than merely mentioning about the new department. The "Wood-Work" item is fair, while the "Repairing" item is excellent.

GUARANTEED WORK

Every piece of work that leaves this shop is guaranteed to be just exactly as represented. We don't substitute, cover poor work with bright paint or misrepresent. You get just what you pay for.

PLOW WORK

Mr. Will Bellingham prides himself on the experience he has had on plows. If you are having plow troubles come in and see Bill.

AUTO WORK

We have just added this new department and have already had several cars in for treatment. Ask Dr. Willis and Dr. Charlton about our auto work.

WOOD WORK

The wood shop is ready to handle any job in timber. The machines are kept pretty busy now—better bring in your orders for special wood shapes.

REPAIRING

What? Anything from a go-cart to a gas or steam tractor. And if you can't bring the job to us we'll go to it in more ways than one.

HORSESHOEING

There are shoers and shoers—John Bellingham has had thirty years of shoeing experience. He believes in giving the horse a fair and square deal.

THE STORE

We started with whips, added axle grease, then stock food, until now we sell a list of things numbering just seventy-six. We can supply many of your farm and stable needs.

BELLINGHAM BROTHERS
GREEN STREET and DELEWARE ROAD

IN THESE DAYS OF GUARANTEES AND SERVICE THE BLACKSMITH IS
RIGHT UP WITH THE LEADERS

THE AMERICAN BLACKSMITH

So is the "Horseshoeing" paragraph. "The Store" is also well written, considering the amount of space devoted to it.

However, while the ad is good as a whole, it is best to devote one's space to one department only—or two at the most. Perhaps the Bellinghams do this, and occasionally get up an ad like the one reproduced. If they do, they are to be highly complimented on their advertising ability. The idea of running a series of single department ads and then following with an ad introducing all branches of the work is excellent.

The two other advertising examples show simple ads that are quite common in the general run of country papers. These "liners" usually appear in with the locals, and if the matter is written up right it should produce business, for the locals are usually read very carefully.

Buying For Profit

A. M. BURROUGHS

The Goods it Pays to Handle Are the Goods Which Go Fast

A haberdasher in Chicago has built his business to the point where he averages a thousand sales a day in a little store 40 feet square—a gross

Colton Clippings

- Busy times these harvest days.
- The ladies of the Baptist church will hold a social next week Thursday.
- Joe Williams has put in a new gas engine.
- Mr. Charles Jardine, who has been confined to his bed for the past two weeks, was out yesterday.
- Joe Williams says his new engine is better than two extra men in the shop.
- Art Skinner shipped two cars of apples last week. He said they were billed for Chicago.
- Joe Williams not only sells the engine he is agent for, but he uses one of them himself. You can see it running his shop machines any day.

A GOOD WAY TO GET YOUR NAME BEFORE YOUR PEOPLE

business of more than \$200,000 a year.

In this little store he keeps a wider variety of goods and makes more real net profit than most stores with five times his space and ten to fifteen times his capital and expense.

The secret of his success is in the small amount of stock which he carries of each line and the frequency with which he turns his capital.

He plans to keep just one day's supply of stock on the shelves and in

the showcases. Every night his stock is replenished just enough to replace the goods removed by the day's sales.

Accurate records for several years have enabled this merchant to know almost exactly how much he will sell of every line each day and to make arrangements in advance for this sale.

He keeps a two weeks' supply of each line in his stock room on the fourth floor, where rents cost him very much less than he pays on the first floor.

Each night he sends down to the store just enough of each kind of stock for one day's business.

By knowing almost exactly how much goods he will be able to sell of each line he is able to make quantity contracts with his jobbers on many lines at quantity prices, with semi-monthly deliveries and monthly bills. He pays after he sells.

If his records show, for instance, that he will need 1,000 shirts of a certain size, his order to the jobber or manufacturer will be for 1,000 shirts, delivered in quantities of three dozen every other week.

Every month he gets a bill from the manufacturer or jobber for six dozen shirts. But he has probably sold five dozen of them before the bill comes, so he can take the discount with money he has already received from the sale of the goods.

He invests \$10 a week in salary for a young woman who gives her whole time to tabulating sales and expense figures.

The report this young woman gives him every day shows not only the number of sales for that day of every line of goods carried, but it shows also a comparison with the preceding day, with the same day of the preceding week and the same day of the preceding year.

If you ask him, "How's business?"

he can tell you, for he knows. He doesn't guess at his figures.

It costs him \$10 a week, a sum which would scare some retailers, but it enables him to do a gross business of \$4,500 a week on a capital

Jepson

- Yes, we've had some rain, too.
- Ira Williams has purchased the Bowen property and will move onto it as soon as a few changes are made in the house.
- Will Clark has painted his shop, and the new sign adds greatly to the smithy's appearance.
- Joel Hemmerling is gradually recovering from his accident of a week ago, when his buggy overturned on the creek road.
- Will Clark is taking care of autos in these parts now. He says they are as much in his line as gas tractors, plows and shoeing.

THESE "LINERS" SHOULD NOT COST VERY MUCH

that is less than some retailers use to do a business of \$100 a week.

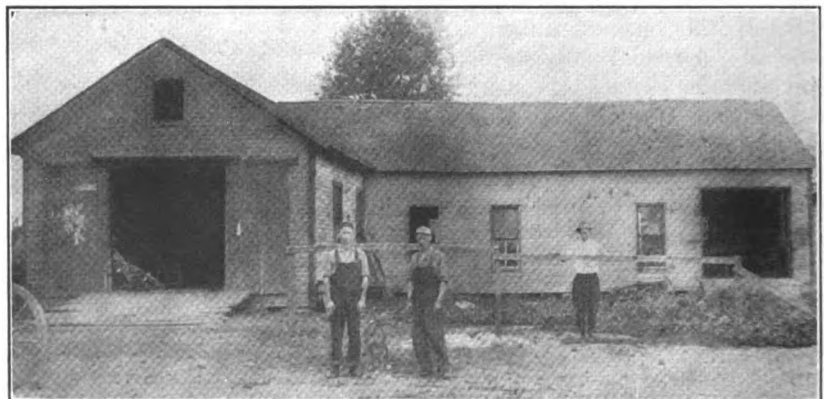
The Maypole Dairy Company with 742 stores scattered all over England handles its vast business in exactly the same way.

Every night each of the 742 stores telegraphs or telephones the exact amount of sales of each line to the home office in London.

The home office immediately ships to each store just enough goods to put the stock back where it was before the previous day's business.

When this company opens a new store it puts \$1,000 into carefully assorted stock, limited to the lines which records show will sell readily. Then an amount is added each day to keep the total up to the original stock.

If at the end of the day the manager wires that he has sold \$500 worth of goods—his message giving the amount sold in each line—the home office will immediately ship him \$500 worth of goods; bringing his total back to \$1,000.



AN INDIANA POWER SHOP—MR. E. BURNS DOES GENERAL BLACKSMITHING

This wonderful chain of stores turns its capital more times in a week than the average retailer turns his capital in a year.

Starting with an original investment of \$1,000 some of these stores do a business aggregating \$200,000 a year—One Hundred and Thirty or More Complete Turns of the Original Capital in a Year.

With very small profits on individual sales, enabling the stores to take business away from competitors, this company last year paid dividends on all its capital of two hundred per cent.

Every one of these stores is required to keep exact records of the sales of every kind of goods carried.

They are very simple records—just a number for each kind of goods and another number for the amount of each sale—but they are a wonder of completeness.

A certain cigar store in New York has one customer who likes a particular kind of cigar, the retail price of which is \$4.75 a box.

This store carried only two boxes of those cigars in stock at first until the demand increased. When this customer bought one of the boxes, which he did regularly every two weeks, another box was ordered. This kept the stock always at two boxes.

On this one customer this one store did a gross business of \$123.50 in one brand of cigars with an investment of \$6.50—supposing each box of cigars to cost \$3.25 wholesale. This is about thirteen complete turns of the capital invested.

If this store hadn't kept records so that it could always know where it stood it would likely have bought a dozen boxes at a time, increasing the investment, reducing the number of times the capital could be turned and letting the cigars get stale.

There is a chain of furnishing goods stores in St. Louis which, through careful buying, succeeded last year in turning its entire capital fifteen times.

This is an impossibility, except under scientific management; which means simply the keeping and using of facts instead of theories.

This chain of stores buys all of its goods in St. Louis where it can get quick delivery and can buy in small quantities.

Some of the lines are turned every week; several more every month, and the entire capital at least fifteen times a year.

A big wholesale house in St. Louis

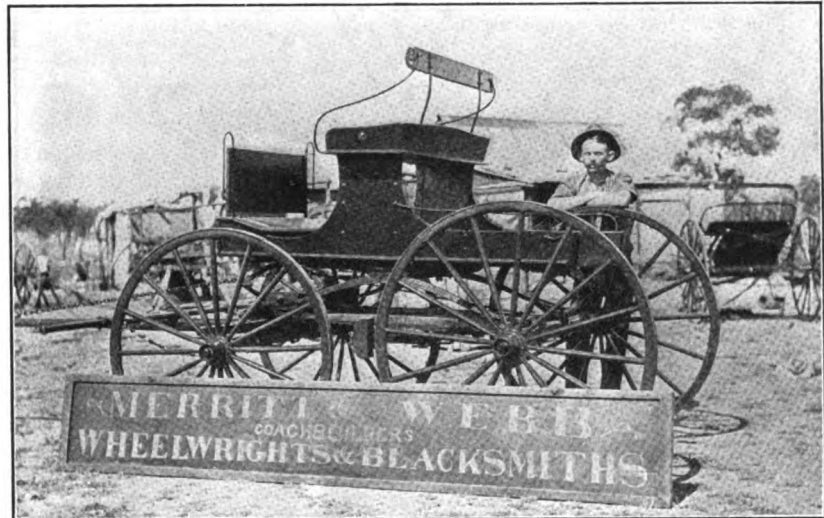
estimates that fully 95% of all retailers overbuy. This wholesale house, unlike many others, urges its customers to buy in small quantities and buy often.

A bright salesman with his eye only on the orders urges the retailer to stock up in anticipation of a raise in prices or to get an extra 5% discount.

emphasize a point of the greatest importance:—

I had a general hardware store, handling shelf and heavy hardware, roofing, paints, oils, fencing, tillage and harvesting machinery, field and garden seeds, fertilizers, wagons and buggies, and did business under my own name as the Brown Hardware Company.

I decided to sell my hardware business last August, so as to give my entire time



THE BUCKBOARD BUGGY IS VERY COMMON IN AUSTRALIA—MERRITT & WEBB OF QUEENSLAND BUILD A GREAT MANY

The overhead charge against the eleven dozen cans of tomatoes on the shelves which don't move quickly eats up the 5% extra discount on the eleven dozen and the 10% which the merchant makes on the one dozen he succeeds in selling.

If a merchant buys in very small quantities he can't lose much if the goods don't move. If they do move he has the money in hand with which to discount the bills when they come due.

The man who started in business with \$5,000 and buried half of it in the ground was better off than the man who buries half his capital in dead stock which doesn't move.

The man who buried his money in the ground didn't pay out the profits he made on the other half to keep it in the ground; the man with half his capital in dead stock has to pay rent and all of his cost of doing business to keep this dead stock on the shelves.

(Copyrighted by Burroughs Adding Machine Company)

A Remarkable Case of Carelessness in a Business Transaction

The following letter came in through one of the papers publishing these articles. It enables me to

to the implement, wagon, buggy, fencing, fertilizer, cream separator, field seed and feed business. I succeeded in selling to W. W. Jones in the month mentioned above. There isn't anything in the way of a written form between us or anything verbal, except I told him what I was selling part of my business for; that I was going to stay in this town and what lines I was going to handle. He asked me not to set up in the hardware business against him, which I agreed not to do.

I let Mr. Jones have the building I then occupied and rented a building across the street for my business, but kept the same warerooms. There wasn't anything said whatever about the name of my business, but I never thought of anything but continuing under the same name. So that when I opened my new store I opened under the name of Brown. Mr. Jones, about a week ago, called me in his store and asked about my changing my firm name. I told him that I didn't think it necessary. He contended that I had to change it and that when he bought my stock of hardware he bought the name, too. He says he doesn't want me to use the name and he doesn't want to use it either; but by my using it says it is an injury to him and is preparing to sue me. I am going to change it without suit, but could he force me? Could he use the name Brown Hardware Company with my consent or use it on his stationery in any way? I have numerous things bought; could he compel me to let him have them? And could I compel him to take them? I agreed not to set up in the hardware business here against him. Now, then, if a man comes to me and wants to order a bill of hardware for his new farm, could I safely order it for him, so long as I don't keep any of it in stock?

Could anything more impressively reveal the utter folly of entering

into any business transaction, least of all one so important as the sale of a business, without one word in writing to define the rights of the respective parties?

Now consider the dilemma of the respective parties here. Jones evidently considers the former firm name of this business of value to him. If the above letter speaks truly, it is not that he wants to use it himself, but that he doesn't want Brown to use it. He probably thought, sincerely, when he bought the business,

the two, for in his position as buyer he paid out his money and took all the risk. He took a particular risk on two points: First, as to whether Brown would stand by a promise—of which there is no evidence—not to go into the hardware business again; and second, as to whether the right passed to use the firm name.

There are two legal questions of general interest involved here:

First.—Will the sale of a business, under such circumstances as these, pass to the buyer either the right to use the firm name himself, or the right to prevent the seller from using it?

Second.—Where a seller sells out the hardware department of his business, for instance, and agrees not to re-engage in the hardware business in competition with his buyer, can he do the things described in the last paragraph of this letter without violating his agreement?

The answer to the first question is no. The law is settled that the right to use a firm name or an individual name does not pass to the man who buys the business, except under an express contract. Here there was nothing in the way of any such contract, and Brown can not only do business under the same name that he used before, but he can obtain an injunction against Jones if he (Jones) attempts to use the old firm name.

The answer to the second question is that when a man agrees not to re-engage in the hardware business, the law will hold that he meant to refrain from buying and selling hardware. As to this part of the agreement, the parties appear to be in accord—they agree that there was a contract that Brown should stay out of hardware, and Brown seems inclined, in a measure at least, to keep it. One can easily see the injustice of permitting Brown, who has sold, not only his stock of hardware, but his hardware business, to go on using the old firm name, and at the same time sell hardware.

Remaining in the hardware business doesn't only mean keeping a stock of hardware; it means *dealing in* hardware. When Brown takes orders for hardware he is in the hardware business, in my judgment,

and Jones could get an injunction against him, unless the contract was so vague and loose as to be null and void. This I believe to be the case. The law will rarely if ever support even a written contract *never* to re-engage in a business anywhere, for it regards this as in restraint of trade. It will support a contract not to re-engage in a business for a certain time, or within a certain district, but what there was of the contract between Brown and Jones appears to have been an unlimited and unrestricted one, and it is very doubtful if the court would uphold it, even had it been in writing. Brown's obligation to stay out of the hardware business under his contract is moral rather than legal, in my judgment.

(Copyright by Ellon J. Buckley)

A Carriage and Wagon Jack



A. C. GOUGH, M. E.*

There is a splendid opportunity, not always appreciated, for the good mechanic to greatly add to his pleasure and profit by building or improving equipment. The difficulty seems to be that it is usually

considered necessary to employ a specialist to design equipment that will produce a special product or to keep a new design within the limits of the equipment at hand. The writer has upon several occasions worked out designs not within the

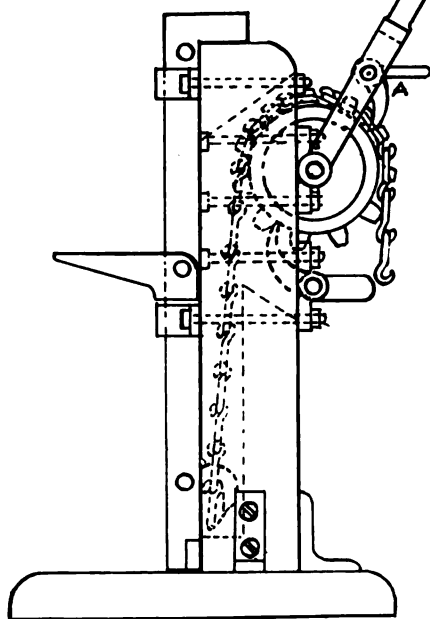


FIG. 1—A WAGON JACK THAT ANY PRACTICAL SMITH CAN MAKE

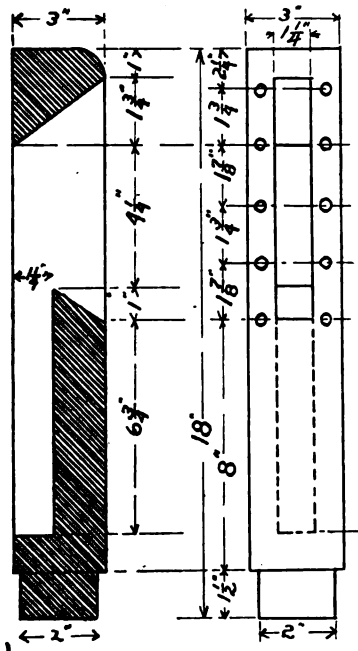
that he got with it the right either to use the firm name, or to prevent Brown from using it. His dilemma is that he hasn't the scratch of a pen to support his claim to a right which, as stated, he considers valuable and thought he was buying.

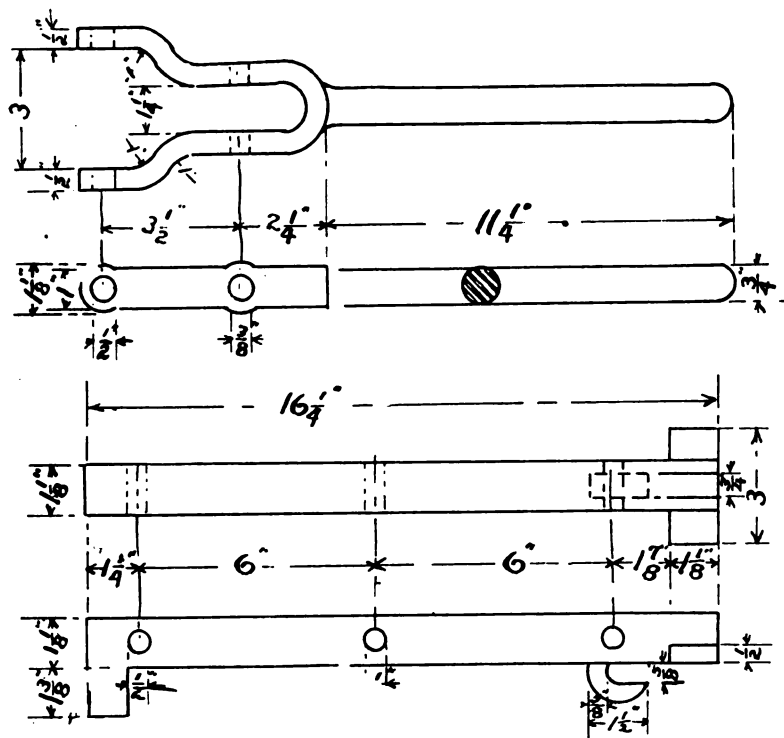
Brown, on the other hand, is just as confident that he never gave Jones the right to control the firm name, yet he too is without any evidence of that fact except his simple word, and he must either stand a lawsuit or tamely submit. If he had given Jones the usual bill of sale, and it had not mentioned the right to use the firm name, Jones' claim would be completely answered. Now it is the word of one man against the other, and each man faces the risk that the jury will believe the other.

It is almost inconceivable that men will be so careless. Jones seems to have been the more careless of

* Mr. A. C. Gough was born in Kentucky in 1877. At an early age he began working in the shop and began a regular apprenticeship in the year 1893 with H. F. Gough & Sons of Benton, Ky. The work in this shop consisted of machine, carriage and farm work, repairing and new work, as usually done in the shops located at the small county seats. After serving the trades, blacksmith and machinist, much of Mr. Gough's time was devoted to model making and the development and construction of new and improved equipment. In 1898 he took up a course in electrical and mechanical engineering; entered the University of Kentucky as a student of mechanical engineering in 1900; spent the several vacations in the shops and returned to the shop during the years 1903 and 1904. He was graduated in mechanical engineering in 1906; with Fairbanks-Morse Mfg. Co., foundry department, summer of 1906; Instructor in charge Forge and Foundry, Iowa State College, 1906—1907; with Fairbanks-Morse Mfg. Co., machine department, summer of 1907; Instructor of Mechanical Engineering, Nevada University, 1907—1910; also, Instructor Railroad Apprentice School and Architectural Drawing at Nevada University, 1907—1910; Instructor of Industrial Arts Academy of Idaho, 1910; with the Oregon Short Line R. R. Co., machine shop, summer of 1910; since 1911 and at present Mr. Gough is Director of Industrial Arts at Academy of Idaho.

For information on his series of articles, which begin with this number, see "Timely Talks with Our Subscribers."





THE HANDLE AND THE LIFTING STANDARD MAY EASILY BE MADE BY FOLLOWING THE PLANS

would probably increase the cost of the tire as well as the cost per mile.

A glance over the list of failures in the tire business should convince everyone of the value of the balanced tire over the one-idea tire. Think of the number of concerns which have started out with flying colors to market a puncture-proof tire, concentrating all their designing on this one idea, only to find that, although they have succeeded in preventing punctures, they have weakened the tire in some other part; so that the cost per mile to the user more than offsets the advantage of being free from punctures. Think of the heavy treads which have been put upon tires which would wear from 20,000 to 30,000 miles, when the carcass under them would not last one tenth as long. Think of the thick-wall carcasses with ten or twelve plies of fabric to prevent blowouts which have gone to pieces in a few hundred miles, owing to the heating and disintegration caused by friction generated as the tire revolved along the road. Think of the fabric reinforced inner tubes which have gone to pieces because they were trying to perform the functions of both the casing and the inner tube; failing to perform

the functions of either well. Think of the self-healing tubes which have been put upon the market to self-heal in event of puncture which have proven impracticable, owing to the difficulty in repairing them in case of pinch or blowout, as well as their increased cost. Think of the cushion tires where the casing is filled with a bridgework of rubber, to do away with compressed air, which have gone to pieces, due to excessive friction and heating; also, think of those filled with metal in the form of springs which crystalize

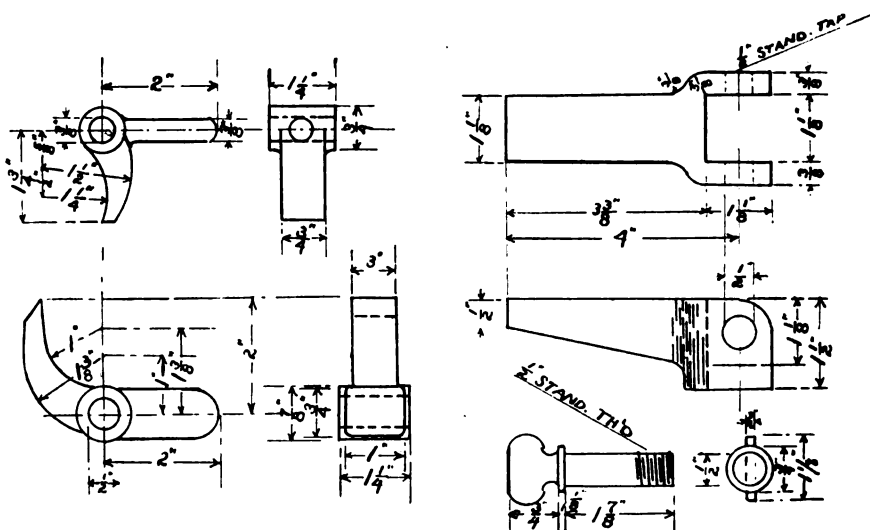
and cut the casing to pieces. All of these types and many others were designed with the one idea of correcting some known defect in the pneumatic tire without giving due regard to preserving the good points of the present standard tire.

Up to the present time but two satisfactory methods of properly and practically cushioning the wheels of an automobile have been discovered. One is a cushion of some kind of compressed gas (air being the cheapest and best) enclosed in a retainer sufficiently flexible and durable, which is the standard pneumatic tire of today, and the other method—the substitution for the compressed gas of a resilient and flexible solid body, for which purpose properly compounded India rubber gives the best results.

In spite of all of the new devices and patents which are constantly being brought to our attention there is nothing yet which seems to have sufficient merit to give it the slightest chance of replacing a well balanced pneumatic or solid rubber tire.

How A Magnet and A Man Save Automobile Tires

He doesn't look like a very important part of a big automobile factory organization—this tall, broad-shouldered man who may be seen, rain or shine, summer or winter,



THE PAWLS, THUMB BOLT AND LIFTING STEP ARE HERE SHOWN WITH DIMENSIONS



"MAGNET BILL" THE TIRE SAVER

walking slowly about the plant of the Willys-Overland Motor Car plant in Toledo, Ohio; but he is an important item in the modern method of factory operation which makes this one of the best conducted plants in the automobile industry. Though his wage is that of the average workman, "Magnet Bill," as the grizzled man is known, is worth a good deal to the company by which he is employed.

"Bill" gets his nickname from the fact that his tools consist solely of one tin bucket, and a big steel magnet strapped to the end of a shovel handle to allow for ease in operation. And his work is mighty important, even though it looks simple to the passerby. For it is "Bill's" duty to save automobile tires by removing from the roadway every nail and bit of iron, brass or steel that might cause a puncture. When it is known that the 40,000 cars, which is the Overland output for 1913, are being run back and forth in reaching the place where they are tested, and scores of visitors' cars, office machines and delivery trucks use the thoroughfare daily, the wisdom of saving tires is at once apparent.

Will You Accept A Calendar for 1913

One of our beautiful 1913 calendars will be sent to each of "Our Folks" whose subscription account is paid up to or beyond January, 1913. So if your account is not paid right up to date, send a remittance to the subscription department, so that you will get one of these beautiful art calendars.

If you are looking for more business at your shop—if you want more customers—if you want to gain the good will of your present patrons, get some of these calendars to advertise your own shop. The price at which we offer these calendars is practically a wholesale price—merely enough added to actual cost to pay packing and carriage charges. You could not get anything suitable even in one or two colors at twice the price; and our calendar for 1913 is printed in ten colors, was painted, engraved and printed especially for us, and no one else is allowed to use it—we own the copyright on it.

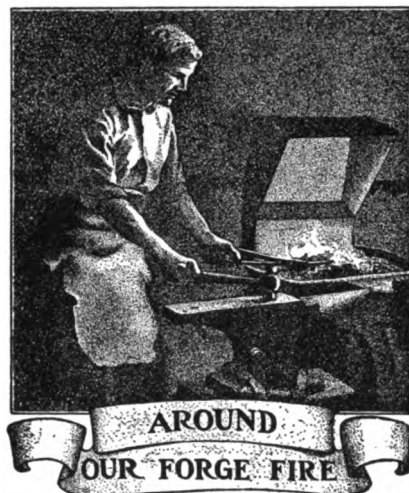
Don't fail to take advantage of this bargain—for at the prices quoted on page 46 it's not a question of affording a few of these calendars, but can you afford NOT to get them?

Your customers will like them, and with your name and business card they become your very own calendars.

If you don't wish to give them out freely, offer a calendar with every job of shoeing—give one to each customer as he pays his bill—offer to give one with each wagon repair job—there are any number of novel ways in which these calendars can be used to stimulate trade and increase business.



"THE AMERICAN BLACKSMITH" HELPS
THE AMERICAN BLACKSMITH HELP
THE AMERICAN FARMER FEED
THE WORLD



Guess Work vs. Know Work

Your answer to the question "How's business?" is simply a question of whether you do Guess Work or Know Work.

Measuring stock by guess, and guessing wrong, isn't an example of Know Work. A bit of figuring done before the shear or cutter touches the stock is an example of Know Work.

How often we hear of smiths boasting of being able to cut stock accurately without doing any measuring. But if you follow these boasters into the shop you will usually find that when they Guess they usually Guess Wrong. Of course they will tell you that they are but an inch or even a half inch "out of the way," but it's a wrong guess just the same.

And there is Guess Work in the business end of smithing, also. There is Know Work, too. Fifty cents plus the jobber's price is not an example of Know Work in the business end of the blacksmith shop. You cannot take the jobber's price, add a certain figure for profit and know accurately what you are making on any given job.

When you figure profits and try to run your business in this way how are you going to take care of running expenses, cost of fuel, the interest on your investment, rent and taxes and the hundred and one other little items that go to make up your expense of doing business? And every single job going out of your shop must carry a certain proportion of these expenses.

You can no more afford to guess at profits than a grocer can afford to guess at weights. What would you think of a grocer who attempted to do business without a set of reliable scales?

And yet there are thousands of blacksmiths who continue to carry on their business without a definite system of cost-keeping.

Remember that a Guess in business is always a Guess at profits.

You can no more lower the cost price by cutting the selling price than you can change the shape of a horseshoe by paring down the horse's foot.

Just ask yourself this question: Why guess at anything in your business? Why guess at profits, costs, expenses, leaks?

A Guess is usually as good as a Miss, and a Miss in business means money; and money is your excuse for being in business. So why make a Guess when money is concerned?

And then, too, it is well to know that leaks and expenses are paid for at full value whether we know them or not; and when we are paying for anything it is well to know what we are paying for.

NOTE—This is number three in the series of Talks by the Editor on Business, Prices, Profits and Costs. The fourth talk, "Brains and Sawdust," will appear next month.

The Craft of Our Fathers

(To the tune "America")
REV. S. RECHNITZER

[The author of this poem, Rev. S. Rechnitzer, formerly ran a large smith-shop, and he himself worked beside the anvil and forge. We are indebted to Mr. I. J. Stites of New Jersey for a copy of this poem.]

Craft of our father's choice,
Oh! how our hearts rejoice
In all thy charms.
We love the anvil's song,
The forge and fire so strong
Craft of our father's choice,
We're true to thee.

Au-to-mo-bile and bike
Crowd wagons out of sight,
Still we toil on.
We teach the 'prentice young
To love the anvil song,
Craft of our father's choice,
We're true to thee.

Tho' face and hands are black,
We swing the sledge with tact—
Still we toil on.
Our arms so straight and strong
Swing to the old, old song,
Craft of our father's choice,
We're true to thee.

Let every blacksmith true
Lift his strong voice to you
And shout aloud.
I love the anvil's song
And the good craft so strong,
Craft of our father's choice,
We're true to thee.



A VERY MERRY CHRISTMAS TO EACH AND EVERY ONE OF "OUR FOLKS"

May perfect health and happiness be your greatest portion, with enough of wealth to make life sweet.

Of course we like coffee, but for regular diet please serve us Prosperi-tea.

Some folks seem to think it a poor rule that won't work their way.

To tell a man's future look at the hard spots on his palm rather than the lines and creases.

There's not very much of nineteen-twelve left—better make the most of what remains to carry you well into nineteen-thirteen.

When are you going to contribute an article for publication in these columns? We are always expecting to receive it.

Stop and think how little good yesterday's worrying accomplished—then you won't worry today. The time to worry is tomorrow, for tomorrow is never here.

Ever notice how many things that you thought couldn't be done are being done every day by some chap who didn't know they couldn't be done?

Some smiths are neither "quality cranks" nor "speed marvels," but like Tom Tardy they are content to float along in mediocrity, not even showing enough interest in their craft to read about it.

How about that coat of whitewash on the interior of the shop walls? Good time right now to brighten and whiten the walls—the doors and windows will be closed pretty much from now on.

"'Nothing ventured, nothing gained,' you know," said Friend Tardy after telling of his latest venture in get-rich-quick circles. "Yes," we returned, "but a fool and his money are soon parted."

Say, Folks—don't forget "Our Honor Roll." Make a place on it for yourself. A ten-year subscription will save you half your subscription money and place your name among the leaders. Write right now.

When out of buffaloes write to Buffalo for more. We've got a great big herd of the pinkies, and they are never so happy as when a bunch is sent scampering away to some good reader. A postal will do when you want a few.

Wish your neighbor smith a real Merry Christmas and back it up with a copy of "Our Journal"—we'll send you another copy. And if you get him to subscribe we'll give six months' credit on your subscription account.

What! Haven't yet ordered your calendars? Better do so today—right now—this very minute. It will pay you to lay the paper down, write out your order and mail it before you read another line. Stop now and do it.

Some business wanders in, some comes through coaxing, but it will surprise you what a big lot of it will come in when you go out after it. And, best of all, you deserve it all, whether it wanders in, is coaxed in or dragged in.

Funny, how often you find folks trying to stop the leaks in the roof by covering the shop with a mortgage. And when there are leaks in the roof there are usually leaks in the business; but a mortgage doesn't usually stop either.

Are your tools in readiness for a rush? If not, get busy immediately. You'll save time and be able to turn out more work. And doing more work when there is more work to do is like making hay while the sun shines.

The Book Department will sell you craft books—binders for "Our Journal"—send you a list of craft books—suggest books for your library—and insists upon delivering satisfaction with every transaction. Better get in touch with our Book Department.

Those who never hear of you or your shop can never trade with you. Only by adding new customers can your business increase; and you can only add new customers by advertising in one way or another. Get busy with your own bugle and blow—then keep blowin'.

Are the changing times making a difference in your business? Are you feeling the effects of the automobile's popularity? What are you doing in order to keep up with the progress of the day? Let us hear from you upon these matters—let us know how you are meeting modern conditions.

The worker who must keep one eye on his machine to keep from losing a finger or an arm cannot turn out as much nor as good work as the chap who can devote all of his attention to his work and knows that with reasonable care his fingers are safe. Safety devices certainly pay in the long run.

How much progress do you suppose would be made in the craft if each smith kept all of his experiences to himself? If, when he discovered a new kink, method or shortcut, he guarded it like a family secret? Just suppose all smiths had done this since the time of Tubal Cain—how much would the average smith of today know? When you share your experiences, your knowledge and give advice, you are building up the future of the craft—you are helping future smiths.

It's our business to help our readers—it's your business to tell us what we can do for you. When you are puzzled over any shop problem, tell us about it. We are now perfecting a system whereby practically all queries are answered immediately. The question and answer will, whenever possible, appear in the same issue—and in the first issue published after receiving the question. Send in your problems—if anybody knows what you want to know we'll tell you quick.

Don't—Don't—DON'T! There is a reason or we wouldn't warn you so often. Don't hand your subscription remittance over to a stranger. Send your money direct to Buffalo. A money order, express order or check is absolutely safe and you are reasonably sure we will get it. The stranger may not advise us about your payment. And when a stranger asks for your subscription—get his name and send it to us with a description of him as soon as possible. There are one or two "strangers" whose acquaintances we wish to make.

Time—the substance of life—what do you do with it? Do you feel at a loss what to do when you have five, fifteen or fifty minutes "on your hands"? Don't just "pass the time away." It is the freest and most common thing we have—yet the most precious—the very substance of life. Many an "oldster" would give a king's ransom for years that he dissipated as a youngster. And yet men do many things to "pass the time." It is a great thing to so occupy each second of every minute that you feel you are living twenty-four hours every day.

Do you know, our Friend Tardy is a descendant of Noah? Yes, Tom can trace a direct line from Noah Count to his immediate family. He's related to the famous Ti-nate family, of whom old Procras Ti-nate is so well known. And then there is the family of D. Dally who's first name was Dilly; and the Lays—Col. D. Lay you remember was an officer in the Army of the Unemployed. The famous Less family are in this same line of descent. Worth Less you know was a brother of Shift Less, who married one of the Nothing girls—she was Marion Nothing. So perhaps Tom's not entirely to blame for his tardy tendencies.

Our Honor Roll

Before the New Year

Now, just before the New Year, is an excellent time to make a place for yourself on Our Honor Roll. The 1915 class is getting smaller every month. Better get into a place up among the leaders. Mr. Watt of Kansas still holds first place, with Mr. Stites a close second. We wonder if anyone will take the lead away from Mr. Watt for the New Year.

If you do not wish to occupy first place, now is your chance to get into the 1922 class. Just count the number of members in that 1922 group. If your subscription expires this month—December—just send a remittance of \$5.00 (\$7.00 in Canada—1£ 14s in other countries) and receive ten years' credit, marking your account paid up to December, 1922. Do it before the New Year.

Insure your subscription. You save time, trouble and annoyance, to say nothing of the real money saving. For example, on a ten-year subscription you save five whole dollars. But do it today—don't wait till after the New Year—do it before the New Year.

	U. S. and Mexico	Other Canada Countries
Two years.....	\$1.60	\$2.00 10 shillings.
Three years.....	2.00	2.70 14 shillings.
Four years.....	2.50	3.20 18 shillings.
Five years.....	3.00	3.75 1 pound.
Ten years.....	5.00	7.00 1 pound 14s.

And then, too, you can gain a place on Our Honor Roll by getting new subscribers. Just show this big list of honor readers to your brother craftsmen. A paper must be pretty good to get a practical man's subscription years and years in advance. Then send in the new subscription orders and we will give you six months' credit on your own account for each new order you send us. That will help you toward an honor place. Will you tell your neighbor?

NAME	Subscription Paid to	NAME	Subscription Paid to
W. C. WATT, Kan.....	Dec., 1930	H. J. DEVONSHIRE, N. Z.....	July, 1917
I. J. STITES, N. J.....	Jan., 1928	V. J. HUBBARD, N. Y.....	July, 1917
W. R. TURNER, Man.....	Oct., 1923	W. R. GELLING, S. Africa.....	June, 1917
T. BRADLEY, N. S. Wales.....	Mar., 1923	J. H. BAKEBERG, S. Africa.....	June, 1917
W. LAWSON, N. Z.....	Nov., 1922	A. R. HALLENBECK, N. Y.....	June, 1917
H. J. WYATT, Wash.....	Sept., 1922	F. C. BOCK, Neb.....	June, 1917
J. N. SKOW, Ia.....	Sept., 1922	YOST & HALVORSON, Minn.....	May, 1917
A. D. STANDFORD, Wash.....	Sept., 1922	W. MCCOY, Kan.....	May, 1917
T. TEMKIEWICZ, Que.....	Sept., 1922	A. GUETTLER, Tex.....	May, 1917
A. PFEIFFER, Ohio.....	Aug., 1922	C. F. J. LORENZ, N. Y.....	May, 1917
J. ERMAN, Ark.....	July, 1922	A. DATWYLER, Ohio.....	May, 1917
ROBERT TOCHTER, Cal.....	June, 1922	H. G. MARRIOTT, Utah.....	Apr., 1917
J. VAN MARTER, N. Y.....	June, 1922	E. THIBAUDEAU, Wis.....	Apr., 1917
E. ANDERS & SON, S. Aus.....	May, 1922	W. PICKERING, S. Africa.....	Apr., 1917
LOUISA CARRIAGE WKS., Va.....	May, 1922	ED. BURROWS, England.....	Apr., 1917
S. SMITH, Tex.....	Apr., 1922	L. KAUSCH, Wis.....	Apr., 1917
J. W. HAAR, La.....	Mar., 1922	J. M. BROWN, Tex.....	Apr., 1917
E. A. DILLON, Nev.....	Mar., 1922	J. C. WOODS, W. Aus.....	Mar., 1917
D. W. SMITH, R. I.....	Mar., 1922	C. BOULTON, N. S. Wales.....	Mar., 1917
R. F. KUSTER, Wash.....	Mar., 1922	C. A. HAWKINS, Ore.....	Mar., 1917
D. H. KEITH, Ia.....	Jan., 1922	A. L. MONTGOMERY, W. Va.....	Mar., 1917
O. M. JOHNSON, Minn.....	Oct., 1921	J. PETERSON, Ia.....	Mar., 1917
H. FELDUS, Neb.....	Sept., 1921	J. ANDERSON, Tas.....	Mar., 1917
W. K. KLINE, Kan.....	May, 1921	A. J. NEILL, Vt.....	Mar., 1917
ED. GRIMM, Tex.....	Mar., 1920	ED. DEITRICH, Ind.....	Mar., 1917
R. S. CRISLER, Ky.....	Jan., 1920	LEWIS CHASE, N. Y.....	Mar., 1917
I. M. TOWNSEND, Cal.....	Apr., 1919	E. O. LEE, S. Dak.....	Mar., 1917
C. WILLIAMS, W. Aus.....	Mar., 1919	S. STEMPLER, Ohio.....	Mar., 1917
T. P. CONSIDINE, Mass.....	Dec., 1918	R. S. GUGIBERG, Kan.....	Mar., 1917
A. J. BROOKMAN & Co., Vic.....	Sept., 1918	J. S. HASKELL, Col.....	Mar., 1917
PETER COCKS, W. Aus.....	Sept., 1918	W. L. ROARK, Tex.....	Mar., 1917
R. J. TOMPKINS, Tex.....	Sept., 1918	A. R. BARLOW, Tex.....	Mar., 1917
A. DISCHER, Aus.....	Aug., 1918	C. A. WHITACRE, Ohio.....	Mar., 1917
ALBERT MELLUM, N. D.....	June, 1918	B. P. CARNEY, Ill.....	Mar., 1917
R. COLVIN, Ind.....	Apr., 1918	A. J. H. WEGENER, S. Africa.....	Feb., 1917
D. C. HOCKEY, Ohio.....	Mar., 1918	H. SCHNETTE, Ill.....	Feb., 1917
RICHARD BRENNER, Tex.....	Feb., 1918	E. DOUGHERMAN, Ohio.....	Feb., 1917
W. F. HILL, N. C.....	Feb., 1918	J. W. HAUGHT, Ill.....	Feb., 1917
P. J. DALLY, W. Aus.....	Jan., 1918	CHAS. F. GIESE, N. Mex.....	Feb., 1917
J. MORROW, Pa.....	Jan., 1918	M. E. GOLLER, Pa.....	Feb., 1917
MESSE BROS., Vict.....	Dec., 1917	J. POTTHOFF, Neb.....	Feb., 1917
KAYE & ANLEY, Eng.....	Nov., 1917	G. M. GARRETT, Mich.....	Feb., 1917
T. H. ZIEGLER, Wis.....	Nov., 1917	ERNEST FINLEY, Pa.....	Feb., 1917
SCHOLLER BROS., Ind.....	Nov., 1917	A. TILLMAN, Cal.....	Feb., 1917
E. M. WURSTER, Mich.....	Nov., 1917	WALKER BROS., N. Z.....	Feb., 1917
S. Z. FREY, Ind.....	Nov., 1917	G. W. WHITTINGTON, W. Va.....	Feb., 1917
B. A. STEINKE, Ohio.....	Nov., 1917	J. H. HOYLE, S. Africa.....	Feb., 1917
J. N. BATHGATE, N. Dak.....	Nov., 1917	IRVING BROS., N. Y.....	Feb., 1917
J. W. RATH, N. Y.....	Oct., 1917	F. ROSCHY, Pa.....	Feb., 1917
W. C. RONEY, Pa.....	Oct., 1917	AUGUST MILLET, Ill.....	Feb., 1917
J. N. MILES, Ky.....	Oct., 1917	C. P. ROBERTSON, S. Africa.....	Feb., 1917
R. ROSS, N. S. Wales.....	Sept., 1917	S. HETEM, S. Africa.....	Jan., 1917
I. E. SPROUD, Me.....	Sept., 1917	G. A. GURLEY, Ore.....	Jan., 1917
C. L. HOCKETT, Cal.....	Aug., 1917	F. K. WADE, Me.....	Jan., 1917
H. C. STENZEL, Tex.....	Aug., 1917	L. V. SENN, Neb.....	Jan., 1917
M. DEJAGER, S. Africa.....	Aug., 1917	S. H. ACSTIN, N. Y.....	Jan., 1917
F. HOWARD, Kan.....	Aug., 1917	H. KAHL, Ia.....	Jan., 1917
H. FERREL, Ill.....	Aug., 1917	J. H. BERGEN, Kan.....	Jan., 1917
J. MCMEKEN, N. Z.....	Aug., 1917	F. G. A. WILLIAMS, S. Aus.....	Jan., 1917
F. H. GIERKE, S. Aus.....	Aug., 1917	ALFRED CASS, N. Z.....	Dec., 1916
F. G. STONE, S. Africa.....	July, 1917	H. GRIMM, Utah.....	Dec., 1916

NAME	Subscription Paid to	NAME	Subscription Paid to
A. H. GOODING, S. Aus.....	Dec., 1916	J. SHARPLES, N. J.....	Mar., 1916
LEONARD SMITH, N. J.....	Dec., 1916	A. ROCKENSCHUP & SON, La.....	Mar., 1916
C. F. SHAW, Man.....	Dec., 1916	C. H. ALEXANDER, N. Y.....	Mar., 1916
W. ELWARD, Pa.....	Dec., 1916	A. M. HAREBO, Wis.....	Mar., 1916
W. W. EOLY, Pa.....	Dec., 1916	GEORGE HOWARD, Kan.....	Mar., 1916
JOS. BOYER, Mich.....	Dec., 1916	G. N. FOLLMER, Neb.....	Mar., 1916
J. WILLIAMS, N. S. Wales.....	Dec., 1916	W. WILLOUGHBY, Mich.....	Mar., 1916
J. H. W. SCHNEIDER, Cal.....	Dec., 1916	H. HOFFMEYER, N. J.....	Mar., 1916
W. SAUER, Minn.....	Dec., 1916	FRANK L. LOCKE, N. Y.....	Mar., 1916
F. F. DARLING, Cal.....	Dec., 1916	FRANK L. EVARTS, Conn.....	Mar., 1916
CHAS. NEWLAND, Cal.....	Dec., 1916	C. R. WINGET, Vt.....	Mar., 1916
J. T. BRAHM, Ia.....	Dec., 1916	H. & J. CHISHOLM, N. Z.....	Mar., 1916
P. H. ST. LOUIS, Wis.....	Dec., 1916	C. F. MOLKENTEN, Aus.....	Mar., 1916
A. E. NICKOLS, Okla.....	Dec., 1916	H. D. PHILLIPS, S. Aus.....	Mar., 1916
C. J. HALL, Wash.....	Dec., 1916	J. B. FRY, Wash.....	Mar., 1916
BOB FRICKE, Ala.....	Dec., 1916	L. A. DOWNING, Cal.....	Mar., 1916
JOERIS BROS., Tex.....	Dec., 1916	A. A. SCHREIBER, Tex.....	Feb., 1916
R. CLEMENS, Conn.....	Dec., 1916	J. T. DILLARD, Tex.....	Feb., 1916
SCHUFFLEY & SCHMITT, Pa.....	Dec., 1916	F. J. FLESSLER, N. Y.....	Feb., 1916
A. BRAUSE, Ohio.....	Dec., 1916	E. P. JONES, Kan.....	Feb., 1916
J. E. BEATTY, Mo.....	Dec., 1916	E. J. BISHOP, N. Y.....	Feb., 1916
GEO. CASSIE, Scotland.....	Dec., 1916	J. N. TYLER, Ohio.....	Feb., 1916
JOHN KAIN, Ky.....	Dec., 1916	C. M. HANUM, Conn.....	Jan., 1916
F. W. HOWELL, Ill.....	Dec., 1916	PETER COX, W. Aus.....	Jan., 1916
T. M. VINCENDA, Wis.....	Nov., 1916	CHAS. H. KERN, Ill.....	Jan., 1916
JOM NOLAN, S. Aus.....	Nov., 1916	J. H. ECHOYD, Cal.....	Jan., 1916
H. J. FRENCH, N. Z.....	Nov., 1916	THOMAS HORNE, Ariz.....	Jan., 1916
F. N. BROWNING & SON, Ky.....	Nov., 1916	CHARLES TUCKER, Mich.....	Jan., 1916
J. MACUAB, Scotland.....	Nov., 1916	M. KLITGORD, N. Y.....	Jan., 1916
P. GEASEN, Ill.....	Nov., 1916	O. STENNING, S. Dak.....	Jan., 1916
J. W. GRIEBLE, S. Aus.....	Nov., 1916	IVER JOHNSON ARMS AND CYCLE WORKS, Mass.....	Jan., 1916
W. G. SIM, N. Z.....	Nov., 1916	FELDMAYER & SCHAAKE, Kan.....	Jan., 1916
H. V. RUEHL, Ala.....	Nov., 1916	CHAS. WINTER, Cal.....	Dec., 1915
G. LINDBORG, Ind.....	Nov., 1916	E. J. BUFE, Ia.....	Dec., 1915
PITTMAN STELL, N. C.....	Nov., 1916	GEO. SYKES, Aus.....	Dec., 1915
J. S. FINKENBINDER, Ind.....	Nov., 1916	W. PATRICK, N. Y.....	Dec., 1915
R. D. WIXOM, N. Y.....	Nov., 1916	JAS. A. SHARP, Mass.....	Dec., 1915
A. W. WAITE, Cal.....	Oct., 1916	J. KRAHULEC, Ill.....	Dec., 1915
C. W. ELLIS, Tex.....	Oct., 1916	P. E. DAHLFURST, Cal.....	Dec., 1915
J. P. SIMON, N. S. Wales.....	Oct., 1916	WM. BISHER, Ohio.....	Dec., 1915
E. A. KNAPP, N. Z.....	Oct., 1916	C. A. JERNER, Neb.....	Dec., 1915
T. J. HASKINS, N. S. W.....	Oct., 1916	G. S. FISHER, Neb.....	Dec., 1915
LOTHIAN & SKINNER, N.S.W.....	Oct., 1916	PRINTERS SUPPLY COMPANY, Neb.....	Dec., 1915
W. B. KNOUFF, Ala.....	Oct., 1916	M. KENNEDY, Tasmania.....	Dec., 1915
GORHAM BROS., Ia.....	Oct., 1916	WILLIAMS & TURNER, W. Va.....	Dec., 1915
W. H. F. BRAUCH, N. C.....	Oct., 1916	C. J. ASH, Kan.....	Dec., 1915
CLARK OLDS & CO., Neb.....	Oct., 1916	F. H. JOHNSON, Mass.....	Dec., 1915
IRVING SCOTT, N. Y.....	Oct., 1916	C. W. AMES, Mass.....	Dec., 1915
C. E. DURHAM, Kan.....	Oct., 1916	E. L. SORENSON, Neb.....	Dec., 1915
M. RINGO, S. Africa.....	Oct., 1916	C. WILLIAMS, N. Y.....	Dec., 1915
W. DELLEY, Queens, Aus.....	Oct., 1916	W. URQUHART, N. Z.....	Dec., 1915
J. J. ILLER, N. S. Wales.....	Sept., 1916	R. RUPE, Kan.....	Dec., 1915
JAMES POTTERSON & CO., Mo.....	Sept., 1916	L. S. KOCHER, Ia.....	Dec., 1915
JNO. GOWTINER, Ia.....	Sept., 1916	P. W. FRASER, N. Z.....	Dec., 1915
GEO. FLECKENSTEIN, Cal.....	Sept., 1916	J. F. SHIMANEK, Md.....	Dec., 1915
GEO. HILL, Aus.....	Sept., 1916	J. MACCLURE & SON, N.Z.....	Dec., 1915
E. C. BEARD, Aus.....	Sept., 1916	H. R. GOODERMOTE, N. Y.....	Nov., 1915
J. K. GLINICK, Mich.....	Sept., 1916	C. M. MCNUTT, Mass.....	Nov., 1915
OSCAR BUNNER, Mich.....	Sept., 1916	A. INGRAM, Cal.....	Nov., 1915
A. J. HAMMOND, Cal.....	Sept., 1916	D. L. MILLER, Pa.....	Nov., 1915
ROBERT MURRAY, Cal.....	Sept., 1916	GEO. BOCKWITZ, Ohio.....	Nov., 1915
D. E. WRIGHT, Pa.....	Sept., 1916	C. DALGAS, Neb.....	Nov., 1915
J. S. HASKELL, Col.....	Sept., 1916	J. D. RHODES, Ohio.....	Nov., 1915
R. SOMMER, Aus.....	Sept., 1916	NORDBROM BROS., Kan.....	Nov., 1915
J. A. SEQUIN, Can.....	Aug., 1916	HUFF & HANSON, Wis.....	Nov., 1915
JAMES CLARKE, Jr., Aus.....	Aug., 1916	J. P. CARRICK, Ind.....	Nov., 1915
DISPATCH FRY LTD., N. Z.....	Aug., 1916	D. CODERE, Ill.....	Nov., 1915
ERNEST E. DOTTY, Ohio.....	July, 1916	F. S. WOODY, Ia.....	Nov., 1915
F. C. ASHTON, Pa.....	July, 1916	GEORGE H. LISLEY, Mass.....	Nov., 1915
HENRY FISHER, Tas.....	July, 1916	M. I. HUFF, Mo.....	Nov., 1915
W. F. FOWLER, N. Z.....	July, 1916	STEPHEN WACHTER, Pa.....	Nov., 1915
A. C. LODWIG, Cal.....	July, 1916	C. J. WILLARD, Ill.....	Nov., 1915
A. A. BARLKE, Mich.....	July, 1916	J. S. LEE, Wash.....	Nov., 1915
J. K. HANSEN, Aus.....	July, 1916	L. P. MORTENSEN, Mich.....	Nov., 1915
J. B. BARKER, Ill.....	July, 1916	R. L. WHITEFIELD, N. S. W.....	Nov., 1915
H. M. LARSEN, Wis.....	July, 1916	CLYDE HOAGLIN, Ohio.....	Oct., 1915
GEO. P. MACINTYRE, Me.....	July, 1916	E. C. BEALL, Pa.....	Oct., 1915
JAS. A. BUCHNER, Mich.....	July, 1916	R. M. ADAMS, Neb.....	Oct., 1915
H. M. FINGER, N. Y.....	July, 1916	A. H. KNIGHT, S. Dak.....	Oct., 1915
L. H. STRANGE, Viet.....	July, 1916	A. WESTERMAN, Dak.....	Oct., 1915
P. O'DONNELL, Viet.....	July, 1916	J. F. HUMBERT, Md.....	Oct., 1915
R. J. HANCOCK, N. Z.....	July, 1916	O. F. MATSON, Utah.....	Oct., 1915
F. G. WILSON, Col.....	July, 1916	W. W. DAIRS, Okla.....	Oct., 1915
I. H. HALL, Ind.....	June, 1916	FRED HENKA, Mich.....	Oct., 1915
F. FULTON, N. S.....	June, 1916	W. FOULKES, England.....	Oct., 1915
J. CHALMERS, S. Africa.....	June, 1916	N. W. HAMMOND, Col.....	Oct., 1915
G. R. HARRISON, Aus.....	June, 1916	P. G. DAIRDSON, N. Dak.....	Oct., 1915
J. WAYCICH, S. Africa.....	June, 1916	C. N. MILLS, Cal.....	Oct., 1915
W. VOIGHT, S. Africa.....	June, 1916	H. DIER, S. Aus.....	Oct., 1915
MARTIN JENSEN, Wis.....	June, 1916	S. B. GOODSSELL, Conn.....	Oct., 1915
CHESTER HUMBERT, Wis.....	June, 1916	D. F. HALLOWELL, Ia.....	Oct., 1915
LINCOLN UNDERHILL, Cal.....	June, 1916	A. ROTH, Ill.....	Oct., 1915
M. BROTON, N. Dak.....	June, 1916	C. C. PERRY, Aus.....	Oct., 1915
HANS ERIKSEN, Ill.....	June, 1916	SIDNEY STEVENS IMP.CO., U.....	Oct., 1915
C. MORRELL, N. Brunswick.....	June, 1916	W. H. FINDLAY, N. Z.....	Oct., 1915
J. O. CONRAD, Kan.....	June, 1916	R. F. WATSON, Cal.....	Oct., 1915
ADAM SCHMITT, Mich.....	June, 1916	H. R. STONE, Conn.....	Oct., 1915
J. G. REEVES, S. Aus.....	May, 1916	F. TEUBER, Ga.....	Oct., 1915
I. H. LUNDE, N. Dakota.....	May, 1916	A. H. KEIR, Cal.....	Sept., 1915
JAMES SINCLAIR, W. Aus.....	May, 1916	L. O. BREKKE, Wash.....	Sept., 1915
H. BAKER, Aus.....	May, 1916	A. TAYLOR, Queens, Aus.....	Sept., 1915
E. Q. KREHBIEL, Kan.....	May, 1916	J. H. NEDER, Ore.....	Sept., 1915
C. H. CAIRNS, N. Y.....	May, 1916	W. H. THOMAS, Pa.....	Sept., 1915
P. V. JOHNSON, Ohio.....	May, 1916	G. A. LINDGREN, Ind.....	Sept., 1915
F. E. SMITH, Vt.....	May, 1916	J. HELPS, Cal.....	Sept., 1915
C. A. STEBBINS, Kan.....	May, 1916	ALBERT BALLMER, Cal.....	Sept., 1915
SANFORD BAKER, Mo.....	May, 1916	SEBASTIAN WAGON CO., N.Y.....	Sept., 1915
E. B. ANDERBERG, Ill.....	May, 1916	JOHN FINN, Ohio.....	Sept., 1915
WELSH BROS., Ind.....	Apr., 1916	J. E. MAY, Wis.....	Sept., 1915
KELLHERR BROS., W. Aus.....	Apr., 1916	W. H. MORTON, Mont.....	Sept., 1915
P. A. PETERSON, Ia.....	Apr., 1916	H. F. KRAMER, Ore.....	Sept., 1915
G. F. BOWERS, Okla.....	Apr., 1916	J. J. DORAN, Va.....	Sept., 1915
D. E. McDONALD, Fla.....	Apr., 1916	W. H. MITCHELL, Mass.....	Sept., 1915
JAMES BAXTER, S. Africa.....	Apr., 1916		
E. P. DIGNAN, S. Aus.....	Apr., 1916		
W. H. WINGET, Vt.....	Apr., 1916		
C. SCHMID, Neb.....	Mar., 1916		

Ten Questions for the Month

1. What is the object of an inventory?
2. How are uncollectible debts charged?
3. To what account are allowances to customers charged?
4. Why are old, slow-moving goods unprofitable?
5. Why is it best to carry a stock of such size only as will meet the needs of the business rather than a large stock?
6. Upon what basis should the percentage of profit be figured—cost price or selling price?
7. Give three reasons for your reply to Question 6.
8. If an article costs \$5.00 and sells for \$6.00, what is the percentage of profit?
9. If an article costs \$3.00, what must its selling price be in order to make a profit of 20%?
10. If an article is sold at a profit of 25% and the selling price is \$5.00, what is the cost of the article?

These questions should be answerable by every practical smith who is attempting to carry on a successful smithing business. If you cannot answer any of these questions, better get busy immediately—study your business, analyze your problems and keep in closer touch with your business books.

Answers to these questions will appear next month.

Answers to Questions in the November Issue

1. Casehardening is the name given to the process of impregnating the surface of steel with carbon; thus causing it to become harder than the interior and to resist wear to a greater degree.
2. Carbon in the shape of bone, horn, leather and charcoal.
3. Coal cannot be used, because it contains elements that are injurious to steel; also the temperature at which it gives off its carbon in the form of gas is not the same as that at which the steel will absorb it.
4. The substance must release its gases to best advantage at a temperature which is practically the same as that at which the steel can

most advantageously absorb those gases.

5. It is generally considered that steel will absorb the carbon gases most advantageously when at a temperature between 1500° F. and 1800° F.

6. The nature of the steel; the nature of the carbonizing material; the temperature of the furnace; the time for which the steel is submitted to the process, and the heat treatment following carbonizing.

7. It is generally considered better practice to use a mixture of carbonizing materials.

8. The object of casehardening is to produce a hard wearing surface on the metal, backed by a tough, strong center. If the entire section of the metal were hardened to an equal degree the metal would not have the required mechanical strength.

9. The steel to be casehardened is usually packed in a carbonizing substance, such as charred bone, leather charcoal or a mixture of these and other carbonizing elements in a cast-iron box or in a crucible and sealed. The box or crucible is now placed in a furnace and subjected to a certain temperature for a certain length of time. When heated sufficiently, the box or crucible is withdrawn from the furnace, unsealed and its contents dumped into a quenching bath of oil, brine or a mixture of other elements. When cooled, the steel will be found to bear a highly hardened surface of a depth corresponding with the length of time for which it was heated and the carbonizing factor of the packing materials.



FIG. 1—A TWO-INCH FORGING MACHINE AND SOME OF ITS OUTPUT

10. If very high heats are used in subjecting the steel to the carbonizing process the steel is likely to become affected at the core. It weakens the core.



The Equipment At the P. & L. E. R. R. Smith-Shop

A. W. McCASLIN

In the engravings, Figs. 1 and 2 show a 2-inch forging machine and its gas furnace with some of their output. Fig. 3 shows two gas furnaces, A and B, for heating high-speed tools for hardening. These furnaces are 12 inches in diameter by 28 inches deep inside. The one at B is used for pre-heating, while A is for heating to the higher temperatures. The top of each of these furnaces has a hole in it 3 inches in diameter; and tools such as reamers, twist drills, etc., which are to be heated, are put down through this hole. When high-speed lathe tools are to be hardened, the crucible shown on the back corner of the furnace at A is placed over the hole in the top of the furnace where any necessary degree of heat may be obtained. The furnace at C is a small coke furnace, placed on the corner of the forge. This coke furnace is very handy; is used for many purposes in our tool-hardening department and frequently for pre-heating.

Fig. 4 shows another view of the hardening department. At D is shown another small coke furnace, built on the corner of the forge. In this furnace all road-tool dressing is done; the welding heats being taken in the forge proper. At E in this

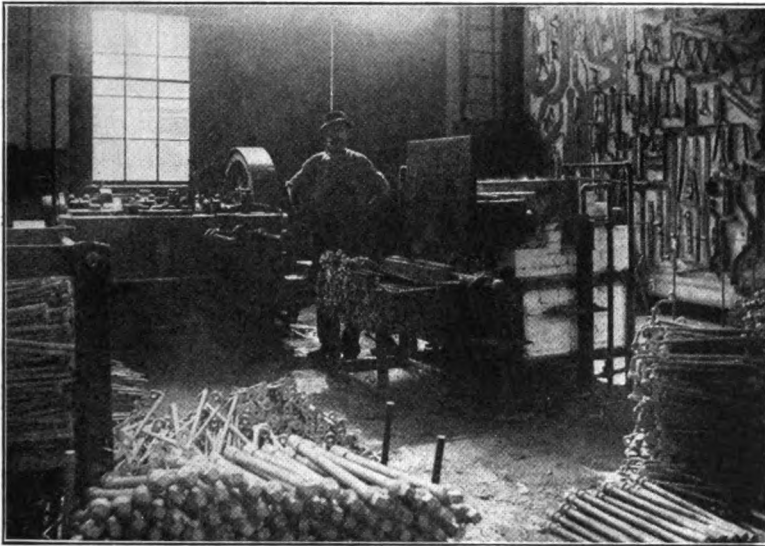


FIG. 2—ANOTHER BATCH OF FORGINGS TURNED OUT BY THE TWO-INCH MACHINE

engraving is shown a round furnace with a cast-iron pot 12 inches in diameter by 28 inches deep. This pot is filled with oil heated to a proper temperature, and is used for drawing the temper in tools for various purposes.

Welding Locomotive Frames With Crude Oil

G. D. VAWTER

Of course you will understand that I mean frames in position. At Moberly we have a number of broken frames. In making an oil weld on a 4-inch steel or iron frame we spread the frame, build a furnace and ram a hole in on each side of frame at welding heat with round pein rams, and then heat wedges in same furnace and lay a wedge on each side of frame, using an oil burner on each

side, unless the break is under the firebox. I then have a machinist cut a piece out in a V-shape on each side of the frame and build furnace and weld the same as on anvil.

In welding the large 6-inch cast-steel frames I have had some trouble, as they are hard to weld and it is difficult to make a good job; but we are cutting these frames out the same as is done in cutting them out to weld on anvil on each side. I then build the furnace and make several small wedges, and weld same as on anvil, thereby using three or four wedges, as I find one wedge on each side cannot be rammed hard enough to weld the center of frame, so we use small wedges and heat in same furnace; laying three or four small wedges on top of each other on both sides of frame.

Locomotive Frame-Making and Repairing

C. V. LANDRUM

To begin with, I wish to state that we make no new frames entirely in the N. C. & St. L. shops, but we make new parts where a frame has been broken two or three times in or near the same place, so as to eliminate bad material or weak points.

It is a well-known fact that a broken frame is not as strong at the weld as it was before it was broken, unless it be made much larger.

Fig. 1 represents a new part. This was forged and finished ready to weld onto frames about 4 inches back of jaw. The top rail was made about 1 inch heavier than the old one. These frames both broke between the jaws in the corner next to the front in the top rail. They were oil-welded twice into place. It was finally decided to replace them with new ones which have now been in service for some time and show no signs of trouble in the future. They are steel frames and on our 270-Class passenger engines.

We have had some failures in oil-welding, but very few. I will mention one in particular: On our 320-Class, being one of our heaviest engines and used as a pusher at the mountain. It broke 5 or 6 inches in front of the main jaw. We tried to oil-weld this frame under the engine, and thought we had, but in a few weeks it was back in the shops, broken through the weld. We then cut out about 10 inches, in order to have room for upsetting

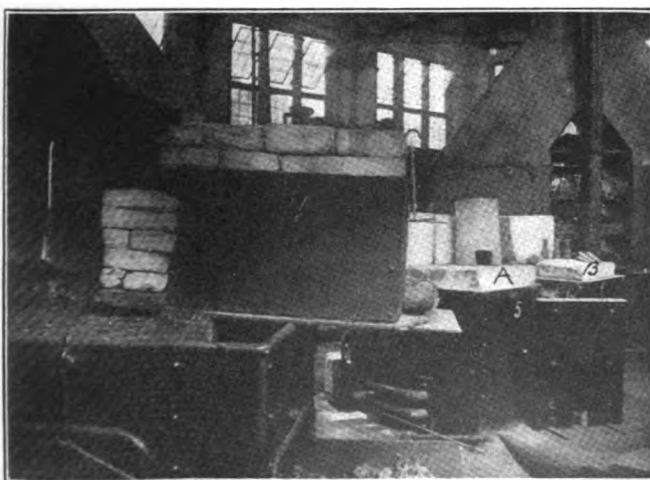


FIG. 3—THE HEATING FURNACES USED FOR TOOL HARDENING



FIG. 4—ANOTHER VIEW OF THE HARDENING DEPARTMENT

each end, and put in a heavier piece; the job looked all right, but in a short time it was back in the shop for another weld. The trouble was

piece as shown in Fig. 3 and proceed as above.

Now in conclusion I will say that it is my candid opinion that if the

easiest way to get the job out. Some shops keep one fire for frames alone, and then keep that fire busy.

Of course there are many ways of repairing frames—each man is inclined toward giving his method the preference; and while some of these ways may be better than others it is largely a matter of using a method with which one is most familiar or one that is best adapted to your particular shop, equipment and frame crew.

A Gasoline Tractor Made in a Smith-Shop

WALTER L. STADIG

The accompanying engraving shows a gasoline tractor made by Mr. V. T. Beaulieu, an ingenious blacksmith of Maine. The engine used is a six-horsepower International gasoline engine and is quite capable

caused by a lack of opening up to give proper compression to make a good weld. It could be forced apart only enough to allow for contraction, on account of the rigid bottom rail, it being about the same section as the top and having no bolts to remove to relieve it; making it impossible to force it apart. After coming to this conclusion it was taken down and sent to the blacksmith shop. When the frame was straightened, the top rail stood open $\frac{1}{8}$ inch at the break, which was about the amount of opening forced at the time of welding, and conclusive evidence that it was the amount of contraction; also that we lacked just that much of having enough to relieve the strain from contraction and that the frame had never been straight. This frame was entirely too small for the engine and the work it had to do.

I will mention one more kind of weld which has been done successfully with crude oil on different classes of our engines. This in the bottom rail close to the jaw; we cut the rail 10 or 12 in. from the jaw, and cut the jaw 4 or 5 in. above the rail; then got out a piece as shown in Fig. 2, welding the rail first; this relieved both welds of any strain. It sometimes happens that the same rail is broken at each end; we then get out a

same care was taken in proportioning and construction of frames that is devoted to boilers for locomotives, that broken frames would be as rare an occurrence as a boiler explosion. Frames are entirely too weak to

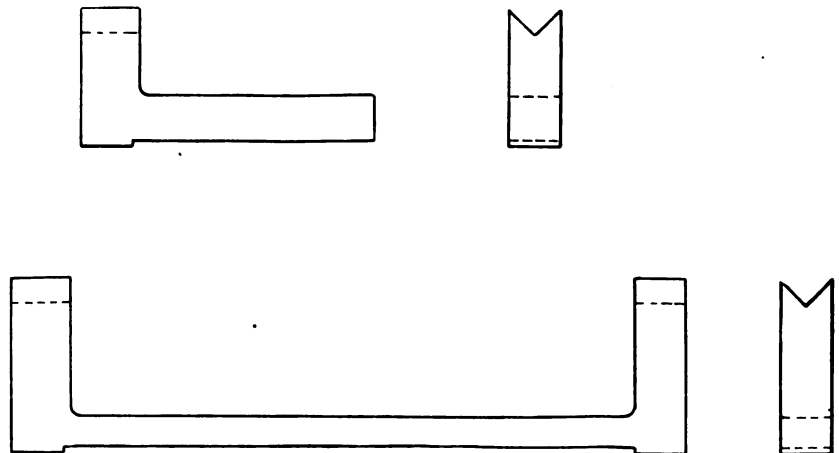


FIG. 3—SOMETIMES A NEW SECTION IS NECESSARY IN ORDER TO GET GOOD RESULTS

stand our rushing traffic of the present day. The strength of frames has not kept pace with other forces that have to be considered and, until the designers take that view of it, oil-welding and repair-welding of all kinds will be on the increase.

Frames break in every conceivable manner and in different places, and the man who does the repairing has to study every frame he has to repair; in order to know how best to make the weld—the quickest, best and

of pulling itself anywhere over the hills in that vicinity. The illustration shows Mr. Beaulieu's two sons at the steering wheel.

For the tractor wheel, Mr. Beaulieu used the driving wheel and mechanism of an old McCormack binder. Various other parts of the tractor were from other old farm machines; thus, practically the only money outlay was for lumber and iron, while the work was done during spare time.

The propelling wheel of the tractor is hung in the center of the frame and is driven by a pinion. This pinion meshes into a larger gear in the wheel—the machine having a speed of three miles an hour. The power is transmitted from the engine by a belt which is controlled by a tightener. The machine is steered by a hand wheel connected

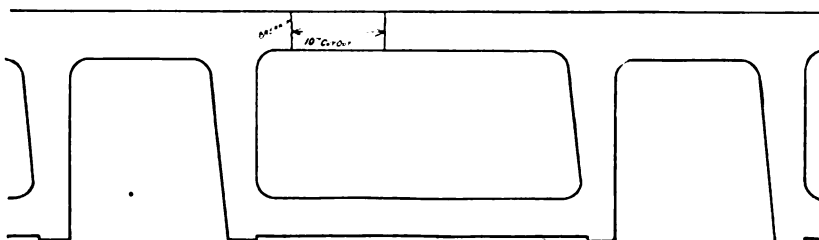
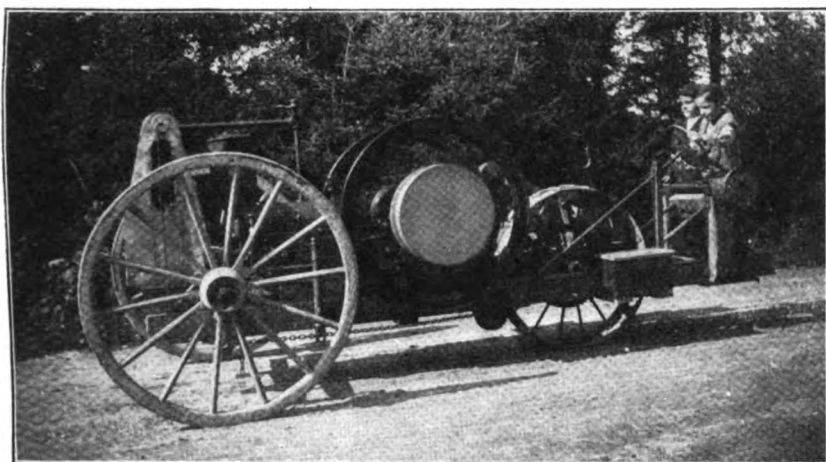


FIG. 2—A PIECE WAS CUT OUT AT THE POINT OF FRACTURE



A GASOLINE TRACTOR MADE BY MR. V. T. BEAULIEU

to the front axle by means of a chain and a bevel gear. The front axle works independently of the frame in a slide.

This shows how easily any practical smith or mechanic can arrange his stationary engine as a tractor or self-propeller at small cost.

The Chapman Rotary Gas Producer

In the steel industry the gas producer has long been one of the most prolific causes of trouble. More money has been wasted in the gas house than in almost any other department. It is now claimed that a new type of producer is eliminating most of these troubles.

The Chapman rotary gas producer, as shown in the accompanying illustrations, performs three distinct operations; one for each of the three steps necessary to the process of making producer gas, viz.:

1. Mechanical feeding and spreading the fuel.
2. Mechanical agitation of the entire firebed.
3. Mechanical removal of the ash.

These in brief are the three fundamental ideas around which this producer is built. Earlier types of mechanical producers have partially performed some of these functions, but none has achieved the complete mechanical control of all three of the necessary steps.

Automatic Feed

The first unique feature of this producer is that its "mechanical" feed has no mechanical parts.

Another feature is that fine and coarse coal are handled simultaneously without separating the coarse from

the fine. Heretofore in mechanical feeds a spout or bell has been resorted to, with the result that the fine fuel drizzled off from the end of the spout into the center of the producer and the coarse fuel bounded from the spout with sufficient force to carry it to the walls. This invariably resulted in a separation of the fine from the coarse coal in the firebed; very much to the detriment of the operation of the producer. With the Chapman feed, this separation is obviously made impossible.

The fuel chamber is stationary and has no bottom. It has a capacity of 1000 pounds of coal—enough to last for half an hour. The lower edge is water-cooled. As the revolving fire bed comes under the chamber a fresh supply of fuel is spread over the surface, thus constantly keeping the level of the firebed up to the bottom of the fuel chamber.

The lower edge of the fuel chamber is beveled so as to produce a down-stroking effect upon the firebed as it passes under it, thus "rubbing in" the fresh fuel.

An interesting feature of the Chapman feed is that it is the only one that will feed the coal in *unevenly* as conditions require. Heretofore the effort has been to drop the coal evenly over the firebed. This is wrong. Coal should be fed into a gas producer *unevenly*, not evenly; for obviously when holes and crevices start to form in the surface of the firebed more coal is required at these points than elsewhere.

The fuel chamber also prevents a rush of soot into the flues each time fresh fuel is charged into the producer. The tarry gas first given off from the coal in the fuel chamber must

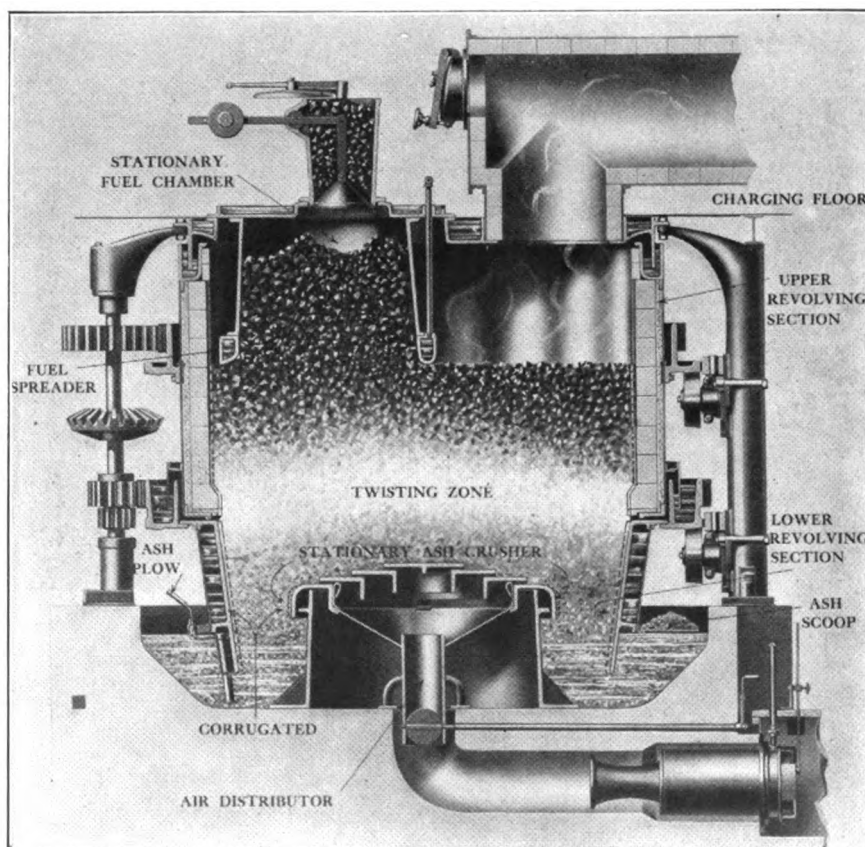


FIG. 1—SECTIONAL VIEW OF THE ROTARY GAS PRODUCER, SHOWING ITS OPERATION AND ACTION CLEARLY

pass down through the hotter fire at the bottom of the chamber before it can escape to the flue. This reduces the amount of tarry smoke in the gas.

The Illinois Steel Company made a continuous test of this feed for the month of August, 1911, at their works at South Chicago. As compared with the operation of the hand-poked producers at this plant this test showed the following results:

1. An increase of 19.1% in the strength of the gas.
2. A decrease of 42% in the quantity of steam required per ton of coal gasified.
3. The elimination of 83% of the soot deposited in the flues.

Agitating Without an Agitator

The second distinctive feature of this machine is the means used for agitating the firebed. Some years

ago the Chapman Company discovered that the best method of agitating a gas producer was to revolve one half of the firebed over the other, thus setting up a twisting and shearing action throughout the entire firebed. The producer is therefore divided horizontally through the hot zone into an upper and lower section, and the two sections are made to revolve in the same direction, but at different speeds.

Each section of the wall carries with it that portion of the fuel bed which it surrounds. Thus the maximum amount of agitation is produced through the hot zone where it is most required. The unique feature of this second step in the process is that adequate agitation is obtained without recourse to an agitating member.

Agitating arms or beams are limited in their action to a comparatively small portion of the firebed at any given time, thus leaving the balance of the firebed to become disorganized. It is claimed that agitating members in the firebed leave in their wake a gap or recess detrimental to the operation of the producer, and they burn off in about six months, in spite of being water-cooled, if they project into the hottest portion of the fire.

Prevention of Clinkers

The chief difficulty in manufacturing producer gas is the prevention of clinkers. Clinkers are caused by excessively hot spots in the firebed. These hot spots are caused by—Uneven spreading of the coal. Uneven agitation of the firebed. Uneven distribution of the air blast. Uneven removal of the ashes.

Uneven conditions in a producer make blowholes, "chimneys" or "pipes" in the firebed. If left alone these holes become rapidly larger, and the temperature about them increases until the fusing point of the ash is reached. Clinkers then start to form about each of these hot spots, and when once formed it is a matter of considerable difficulty to remove them. If the excessively hot spots are avoided and the uneven conditions prevented there will be no clinkers.

In the Chapman producer the twisting of the upper half of the firebed over the lower shears off the holes as fast as they tend to form. This action, together with the fuel spreader and the continuous ash removal, effectually prevents the formation of clinkers.

This freedom from blowholes is evidenced in the unusually low temperature of the gas (about 1200° F.) and also in the lack of soot. So small is the amount of soot made that the Chapman Company have recently been able to enter into a contract guaranteeing that an installation of three of these producers will operate continuously for two months without requiring a shutdown for flue cleaning.

Ash Removal

The last step in the process of making producer gas, that of removing the ash, is accomplished in this producer in an equally novel manner. The ashes are first ground between the sides of the stationary corrugated

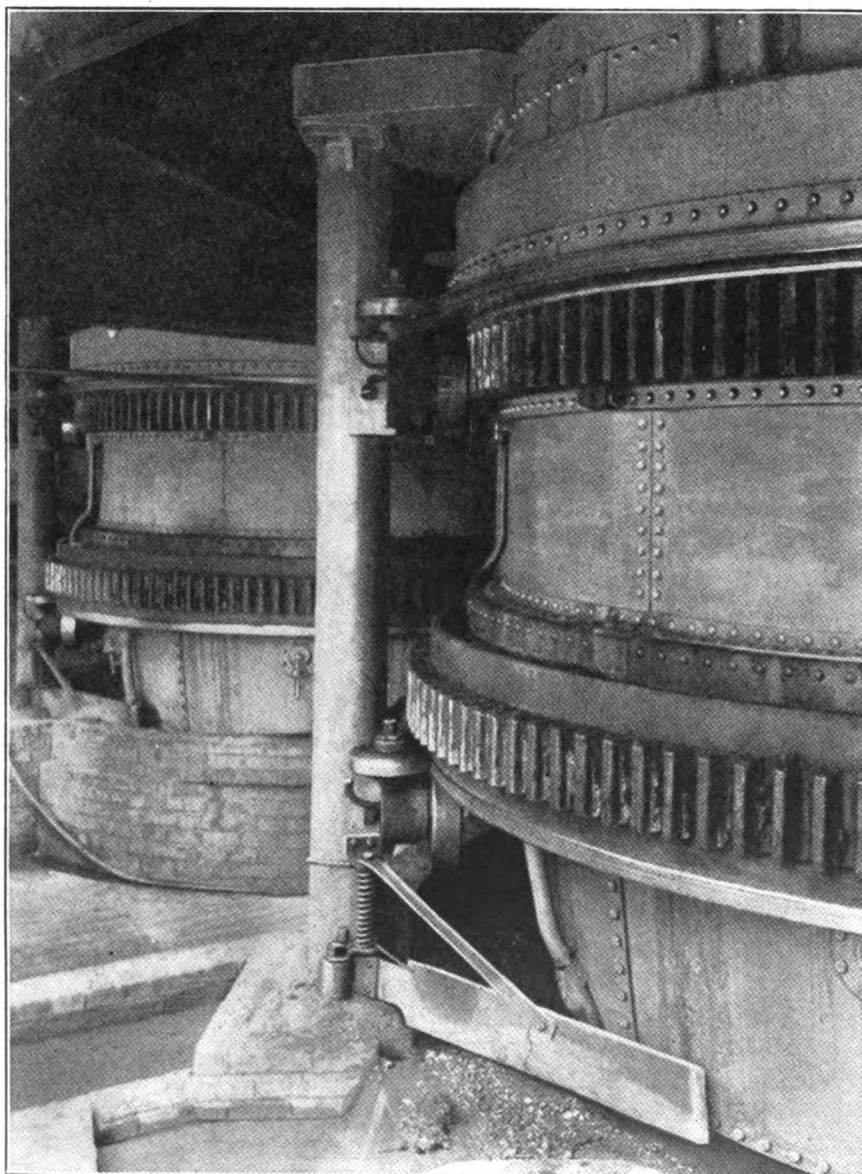


FIG. 2—AN INSTALLATION OF ROTARY GAS PRODUCERS IN OPERATION AT A STEEL PLANT

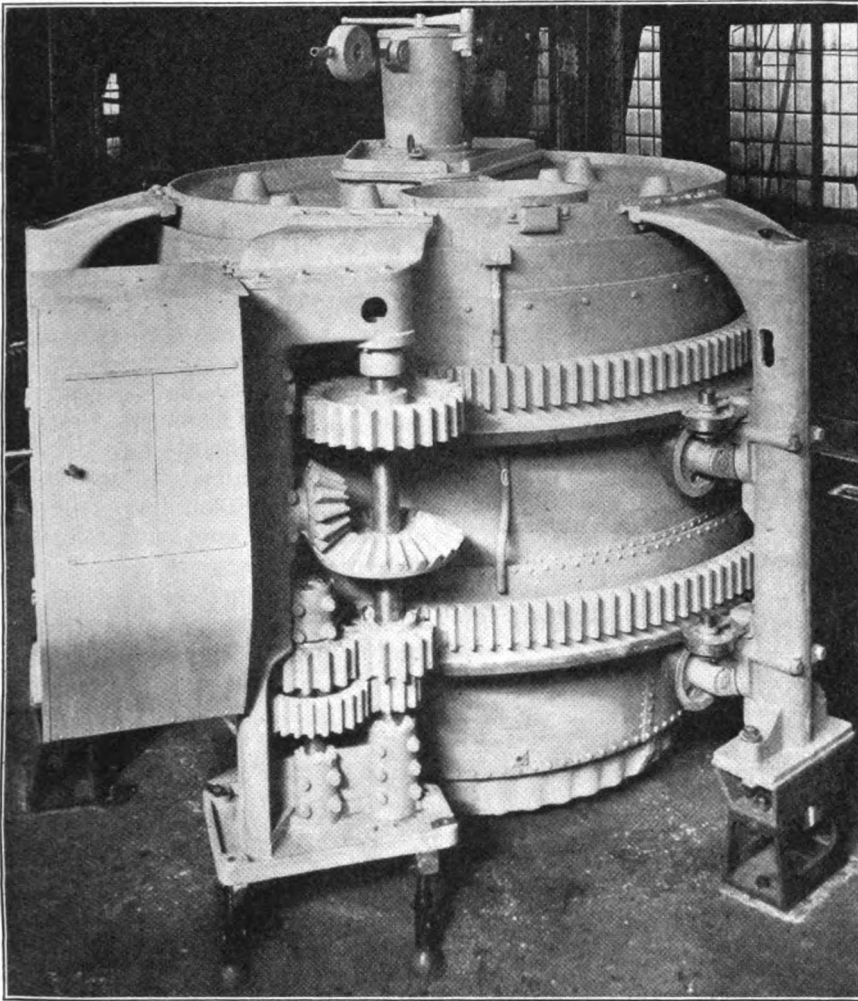


FIG. 3—A ROTARY GAS PRODUCER ON THE ERECTING FLOOR

air box or "ash crusher" and the revolving corrugated wall of the lower section. In mechanical producers the crushing of the ashes is a very necessary preliminary to their removal, as otherwise an occasional large chunk would block the operation. After the ashes have been crushed they are forced up to the top of the ash pan by three adjustable ash plows. These three ash plows are kept continually in operation and are easily adjusted when occasion requires, which is not often.

As fast as the ashes are lifted to the surface of the water in the ash pan they are automatically scooped up and carried to the required point for automatic discharge. The fact that the ashes in being removed are removed upward instead of downward makes a saving of several feet in the height required for the gas house and foundation.

There is little or no advantage in removing the ashes mechanically if they cannot be removed continuously. Heretofore all mechanical ash re-

moving devices have been intermittent, operating for possibly an hour once or twice in twenty-four hours. This invariably resulted in a badly disorganized fuel bed, requiring several hours to rectify. The ash-removing device in the Chapman producer is the first to fill this important requirement of being continuous.

Capacity

As a result of the joint action of the automatic fuel spreader, the twisting of the firebed and the continuous removal of the ash, this producer may be made to gasify a ton of coal an hour—at least twice the capacity of the ordinary hand operated producer, and at the same time the quality of the gas is greatly improved and more uniform.

Record at Cleveland

In ordinary practice with the old style hand operated producers the gas usually varies about 20% in strength during each day, while the weekly variation is usually over 40%. The Chapman Company be-

lieve that they have established a new record for uniformity of gas production. The greatest amount of variation in a two weeks' test at the Consolidated Works of the American Steel & Wire Company, in Cleveland, was only about 2½%. At this plant three producers have been in operation since November, 1911; one of them (the first order) has been in operation two months longer. The average results of a two weeks' test, conducted by the American Steel & Wire Company, in April, 1912, at this plant, showed the following gas:

Combustible, 42.22, BTU, 150.8, CO₂, 6.54, ILL, .51, O, .31, CO, 21.91, H, 17.1, CH, 2.70, N, 50.90.

The greatest variation from the average of 150.8 BTU was but 2.54%; the poorest gas having 147.34 BTU, and the best, 154.6 BTU.

Record at Youngstown

A similar producer has been in operation at the plant of the Youngstown Sheet & Tube Company, Youngstown, Ohio, for nearly two years with even better results than the above. The CO₂ has averaged between 4 and 7%, and the CO between 20 and 25%, while the BTU'S have kept close to 160%.

Attention to Details

The details of this machine have been worked out with unusual care; no expense seems to have been spared, and the result resembles Corliss engine practice rather than gas producer construction. For example, the following is rather unique construction for a gas producer:

The supporting rollers run on high carbon steel pins and are provided with brass bushings. These rollers are cast in a chill and ground. Separate rollers are used to take the side-thrust; all rollers are mounted in pairs set in equalizing yokes; all bearings are provided with large oil wells filled with waste, after the manner of railroad cars. The faster gears run in oil. Steel castings are used extensively both in the gears and throughout the balance of the construction, and six years of continuous effort were put upon this producer before it was ready to be placed upon the market.

Efficiency

Stripped of all technicalities and reduced to plain common sense, efficiency simply means the intelligent

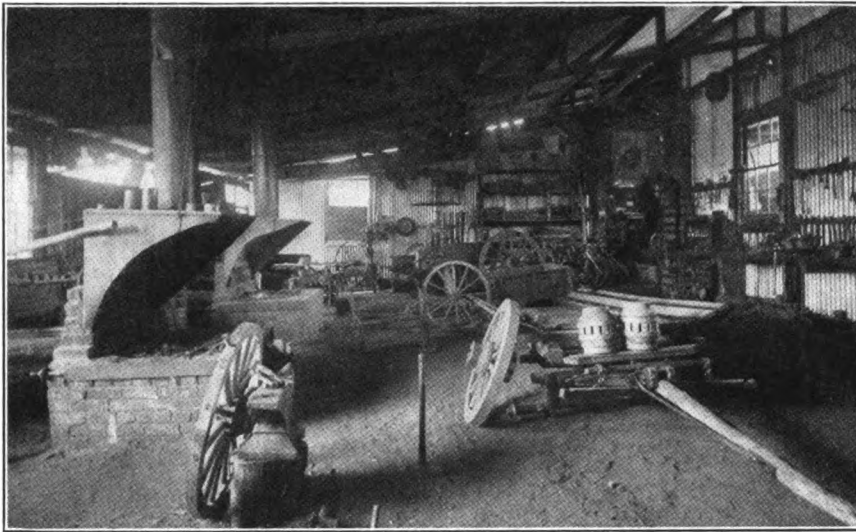


FIG. 3—THE WAGON AND SMITH-SHOP OF METHUEN BROTHERS

direction of energy; whether it is supplied through natural agencies, such

shop, and Fig. 4 is a view of the stables back of the shop.

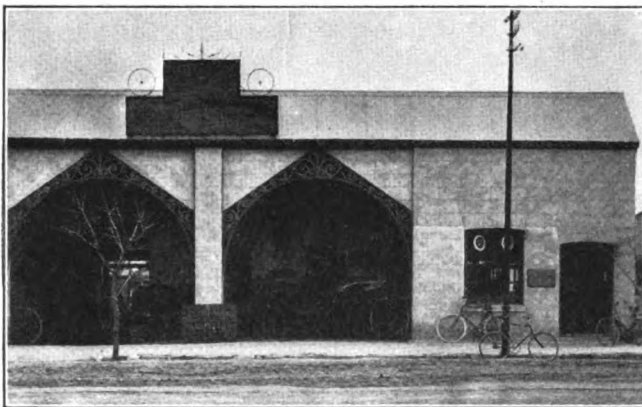


FIG. 1—THE GENERAL SMITHING ESTABLISHMENT OF METHUEN BROTHERS

as waterfalls, by combustion or by human effort, in such manner that the desired results are obtained by the smallest expenditure of force. To obtain maximum efficiency, therefore, it is necessary that we should take advantage of the lessons of the past, the knowledge of others and the skill possessed by men who have by long years of service made themselves adepts in performing the particular kind of work to which they have applied themselves.

A General Smith-Shop of South Africa

The several engravings herewith show the shops and premises of Methuen Bros. of Rhodesia. Fig. 1 shows an exterior view of the shop; Fig. 2 shows a corner of the bicycle and gun repair shop; Fig. 3 shows the interior of the wagon and smith-

Methuen Brothers are engineers, general blacksmiths and contractors.

form for the work being done. The steam and compressed-air hammers



FIG. 2—A CORNER OF THE BICYCLE AND GUN REPAIR SHOP OF METHUEN BROTHERS

Their line of work includes drilling, turning and casting; erection and repair of mining and other machinery; making wagons, carriages, wheels and axles; tire work and shoeing; and they repair guns and bicycles and carry accessories in these lines.

A Well Designed Belt Power Hammer

A. C. GOUGH, M. E.

One without experience might consult an encyclopedia and conclude that all power hammers would be suitable for almost any kind of forging; unfortunately for the general shop this is far from true. To produce good sound machine forgings it is necessary to use a hammer that will deliver blows with the proper force, at the desired speed and provided with dies of the proper

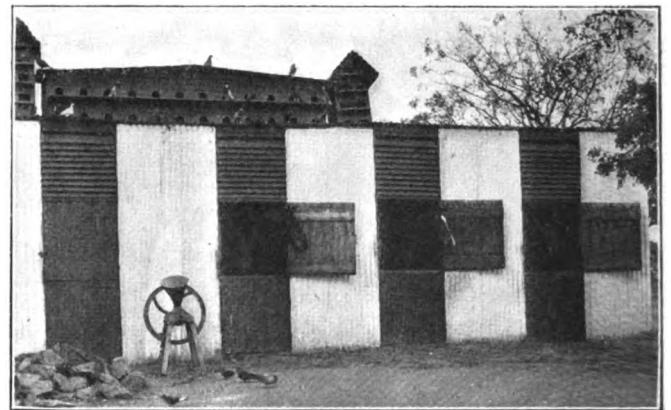


FIG. 4—METHUEN BROTHERS' STABLES ARE LOCATED BACK OF THE SHOP

possess these qualifications and have proved most satisfactory for machine forgings; but the common vertical type is not altogether suitable for carriage work. There are other important things to consider, also; one being the cost. Steam and air equipment are usually considered too expensive for the general repair shop.

During the last few decades the belt power hammer has been developed to a standard of efficiency which has given it general use in the repair shops. The greater possibilities for neatness in design together with other advantages would, most probably, have given the vertical or Justice type the first place; except that it is not suitable for welding tires, especially small tires. Probably due to the difficulty mentioned, the beam or helve hammer has come into more general use. It is not necessary for one to study design in order to realize that the possibilities of design in the matter of the beam hammer are unlimited; as there are large numbers of good strong hammers of this type upon the market. With the proper dies there is no possible doubt that the beam hammer will prove satisfactory for sharpening plows, welding tires and forging small parts, but not altogether suitable for welding axles, and especially for thick forgings. While it is not a fatal defect, as the general use proves, yet the fact remains that if the dies are secured parallel when the top die rests upon the bottom die the faces will not be practically parallel when the top die is raised a few inches. This tends to leave the work thicker on one side, especially when the forg-



MR. P. S. JENSEN'S GENERAL SHOP OF COLORADO IS OPERATED BY POWER

ing is thick, which is not always desirable. Another difficulty occurs when it is attempted to use the fuller, cut-off and other tools under

fact is not so pronounced in the hammers which use an extra long beam.

One of the principal reasons why users of steam and compressed air hammers have contempt for the belt hammer is that the belt hammer delivers light blows slowly and the heavier blows faster, when the reverse is usually desirable. A belt hammer may be designed which will deliver the light blows fast and the heavier blows more slowly, but it is not yet considered practicable. The writer has also found it not very good practice to often have to change the dies, as may be the case in the general shop. The accompanying design, shown Figs. 1 and 2, is an attempt to produce a hammer using one set of dies which will practically perform all the work required in a small repair shop. Due to the fact that the ram or die is carried by two parallel beams its face may be parallel at all points in the path of travel to the face of the lower die. Or by adjusting the upper rod or beam, the face of the upper die may be set at an angle to the lower die in two directions, for work with sides not parallel. Of course, when it is desired, the hammer shown may have a cast-iron base and ram and be provided with a number of sets of dies; but if the dies be made more nearly square, with the face of the upper die the least bit convex, other dies may not be found necessary.

The writer has developed a large number of designs including electrical and belt power hammers, though this is not offered as the best and neatest design, but it is offered as a trim design which may be almost altogether built in the forge shop; even the pillow blocks

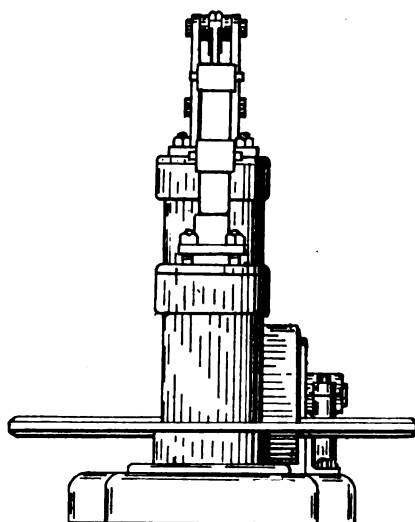


FIG. 1—FRONT ELEVATION OF MR. GOUGH'S POWER HAMMER

this form of power hammer, on account of the direction in which the blows are delivered. This de-

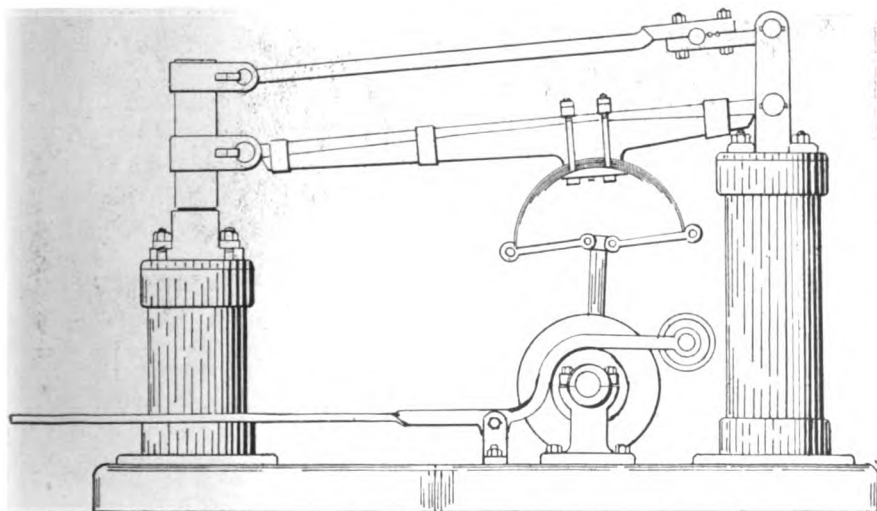
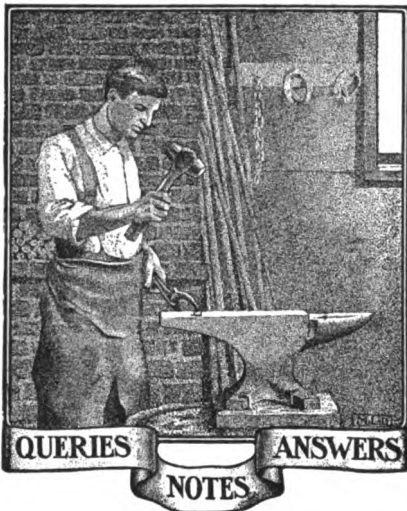


FIG. 2—SIDE ELEVATION SHOWING ARRANGEMENT TO KEEP THE DIES PARALLEL

may be forgings if desired. It would be almost necessary to make the pulleys out of cast iron, and the larger pulley should be very heavy. A good size wrought iron pipe with heavy bands shrunk on the ends, and provided with heavy wrought-iron end plates secured by strong bolts in the manner shown, provides a strong and rigid base or pedestal. It is believed that the shop lacking the pattern and foundry department may find this form of pedestal very satisfactory, generally.



Wants to Nickel Shoes.—I desire to learn of some simple, reasonably priced method of nickeling shoes. Some method that is not expensive. Can some practical brother tell me?

D. G., Indiana.

Cold Setting and Hot Shoeing.—The question to me is: does the cold upsetting hurt the nature of the iron or not? If not, then I see no earthly reason why (with the proper use of a man's brain) the cold way should not easily be the best way. It is easiest and quickest, but of course some people must stick to old time methods. They tell me that the first person who said the "world was round" was put in prison, and I suppose people always feel that way about new ideas. Also about hot or cold shoeing—some of the readers object to using the hot way, but I have read that the French army have put it to the test and found that the hot way came out best as long as it was a good sound foot that had to be shod; the shoe stayed on longer and the foot grew better afterward. Personally, I know an old blacksmith in the old country, who is called the best shoer in the country, and he always used the hot way. I never saw a horse come back lame after he had shod him, and I have seen the shop full of smoke from burning feet.

A. W. BARNES, Canada.

A New York State Shop.—The accompanying engraving shows my general shop. We do general blacksmithing and horseshoeing; also have a wood shop and a paint shop on this same lot doing a good business. In the busy season we have five men working, and work three men all the time.



AN AUSTRALIAN SHOP, RUN BY MR. JOSIAH WILLIAMS

I got an L. S. P. Calking machine a while ago—got acquainted with the machine through the ads in "Our Journal"—and am well pleased with it. It takes the place of a man.

I enjoy reading THE AMERICAN BLACKSMITH, especially the articles on horseshoeing. I believe a man should thoroughly understand all there is to a horse's foot and how to put a shoe on right. If you can suggest some good books on horseshoeing, through "Our Journal," I should appreciate it very much.

R. E. DECKER, New York.

In Reply.—There are a number of books on horseshoeing that Mr. Decker will no doubt find very interesting and valuable. Here is a list with the price of each book. These books are sent postpaid anywhere on earth on receipt of price. Believing that other readers of "Our Journal" may be interested in securing one or more of these practical books on horseshoeing we give prices in both United States currency and in shillings and pence.

"Text Book of Horseshoeing".....	\$2.00
"Art of Horseshoeing".....	1.00
"Rich's New Artistic Horseshoeing".....	2.00
"The Foot of the Horse", Roberge.....	5.00
"A Handbook of Horseshoeing", Dol-	
lar.....	5.00

These books are all reliable, are written by men who know, and are just what the practical shoer needs.

BOOK DEPARTMENT.

An Australian Smith Shop:—My July copy of "Our Journal" came to hand yesterday, and I see quite a number of Australian letters in it. I suppose they are getting

like myself, the more they see of the Journal the better they like it. I saw in this last copy a letter from Mr. J. Munro in which he describes a tuyere iron the idea for which he says he got from an Australian smith. Well, it is said one must go from home to hear news about it, and as I just had one of my water tuyere irons burn out I put one in of his description today and it seems to work well.

I see a lot of controversy over tire setting, but I suppose it is like the hot and cold setting of horseshoes; it requires a smith to use his judgment in both cases. I have not seen a cold tire setter at work, myself, being so far from the railway. Up till the last few years the railway was 180 miles from us, but now it is much closer, being only 60 miles.

According to Mr. H. Turner's paper, the *Modern Smithshop*, we in the back parts of Australia are not out of the woods yet, as I do my own woodwork and smithing when I have no smith engaged, also painting and trimming; my two sons helping me. I also do bicycle repairing. I have agencies for bicycles and Edison Phonographs.

JOSIAH WILLIAMS, New South Wales.

Several Answers to Questions.—Answer to E. E. Battroff, South Australia, July queries—He bent his iron on what is termed the dangerous blue heat—a heat that makes the iron more brittle than anything else except heavy frost.

To W. T. Plumbe, Victoria, Australia. In my experience, the difficulty in getting a good weld never rests with the steel itself, but with a faulty fire. Have a good



THE GENERAL SHOP OF MR. R. E. DECKER OF NEW YORK STATE

THE AMERICAN BLACKSMITH

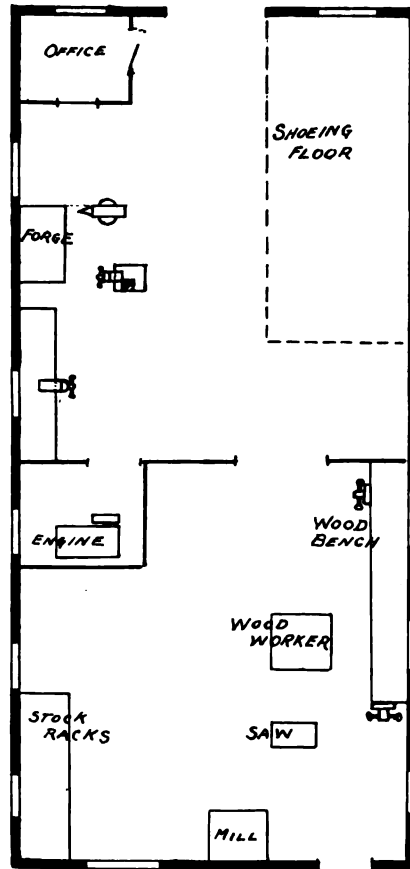
clean fire with at least $4\frac{1}{2}$ or 5 inches of well coked coal between your blast and the steel, so that the oxygen is well burned out before it strikes the steel. To weld buggy axles alone is not an impossible thing. Proceed as follows: Scarf the hub first, then the other pieces. Put the coldest piece under and the other on top with a piece of Laffitte welding plate between. Be sure to have the lap cut at the proper angle. Start your fire going and as soon as you have a good orange heat, press the parts together with a pair of heavy tongs. It will stick, so you can twist and turn it in the fire as you like, to get a good welding heat. It will fuse so solid you can lift the stub with the axle out of the fire. Place on the anvil and use a heavy hammer to weld up with. I use a No. 10 with a short handle for the first few blows. If the welding plates are not obtainable, make a compound as follows: Take one pound of borax, melt it in an iron pot over the fire and keep it covered to exclude dirt. After it is cold, mix up with four ounces of sal ammoniac and one half pound of fine iron drillings. If drillings are oily, burn the oil out of them on an iron plate over the fire. Place this compound on scarf when it is red hot. This can be used for both fusing the metal in the fire or to unite on the anvil. The welding plate works best when the steel is fused in the fire and welds at a very low heat.

A Shop Plan.—As I am going to build a new shop I want some one to give me plans for fitting and placing the following machines properly: a crescent woodworker; a band saw; a grist mill; a gas engine; a forge; a drill and the small tools usually necessary in general repair work. The shop will be of brick and 22 by 70 feet in size.
R. E. McELVANY, Mississippi.

In Reply.—The machines described by your reader are well chosen for his work, and in a shop of that size he should be able to make things hum. The plan of the shop as I have worked it out would meet conditions as I see them. This plan may not meet the approval of your reader, but it will give him something to work on.
L. H. G., New York.

A Pennsylvania Smith's Pacer.—Here is a picture of my shop, myself, my helper and my bay pacing stallion. The shop is 20 by 46 feet inside and is well equipped. I have two fires, two drills, a cold tire setter, a hot tire shrinker and one L. S. P. calking machine. I have all the smaller tools that are necessary to run a general shop.

I do horseshoeing and all kinds of blacksmithing. The price of shoeing is 35 cents a shoe up to number fours, and forty cents



THE SHOP LAYOUT FOR MR. McELVANY

a shoe for numbers five, six and seven. Tire setting at fifty cents; four new buggy tires at \$5.00.

The name of my pacer is "Cobbet." He made a record at four years of $2.11\frac{1}{4}$.
JOHN HORNE, Pennsylvania.

A Well Equipped Kentucky Shop.—The engraving on page 78 shows my shop. Myself and my son are standing before the shop with aprons on. Our shop is 76 feet long and 20 feet wide. The blacksmith shop is 40 feet long, while the wood shop is 36 feet long. Our tools consist of one four-horse International gasoline engine; one Vulcan power boring machine; one Chapman power drill press; one 10 by 36 screw cutting lathe; one Silver power spoke tenoning machine; one House cold tire setter; one Park ball-bearing

wood worker; one power grindstone; one emery stand; one Silver power hub boring machine; two blowers; one hot tire setter; one Reynold tire bolter; one set Little Giant screw plates; one thread-cutting machine and all the small tools that four men can use. We have all kinds of wood tools. Have work for two and three men all the time. Collections are good—we sell all kinds of farm implements.

About the cold tire setter—it's all right if the man knows how to use it. I think the paper is one of the best in the world.
J. B. ARNOLD, Kentucky.

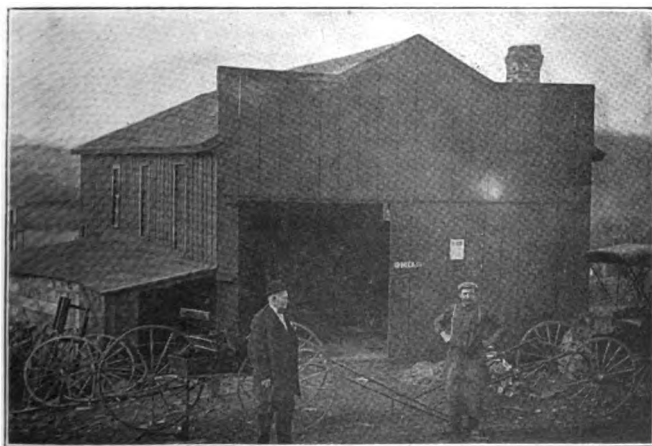
An English Smithy.—Our work consists mostly of shoeing and farm implement work. This is a small village. Our prices are but 3 shillings (\$.73) for farm horses, and 4 shillings (\$.96) for hunters and hacks. I have a fairly good business, as work comes to us from four miles around. The engravings on page 78 show part of the smithy and a part of my home. In the shop picture my man is burning an old shoe on an overgrown hoof for photographic effect. I am standing beside the mower, while my son stands opposite at the right in the picture. The other engraving shows one corner of my home. The tree at the left is what we call a Whit-sun Rose. It is beautiful when in bloom.
J. J. SHERWOOD, England.

A Bit of New Bedford (Mass.) Blacksmith History

For the first time in half a century the fires in the forges of the little brick shop on Mechanics Street are dead. The closed and barred door seems strangely unfamiliar, and old habitues of the lane miss the singing of the hammers and the symphony of the blacksmith shop. Just off the beaten track, out of the eddying currents of a hurrying city, the years have passed unmarked. Still progress has crept nearer, and today Tripp & Haney have closed their doors and moved out on Mill Street. Another landmark is doomed to be swept into the past.

The story of the old blacksmith shop is closely interwoven with the life of Jeremiah L. Luce. As an apprentice he learned to forge and hammer under the new roof, and a man of mature age he shod his last horse beneath the soot coated rafters scarcely two years before the doors were closed forever.

In 1857 Mr. Luce, then a boy in his teens, came up from Martha's Vineyard and began his apprenticeship in the blacksmith business. In those days Mechanics Lane was a struggling cowpath winding its way in and out among the scattered shops from Elm to Purchase Street. The



THE GENERAL SHOP OF MR. JOHN HORNE IN PENNSYLVANIA



MR. JOHN HORNE'S PACING STALLION, "COBBET", $2.11\frac{1}{4}$



THE KENTUCKY GENERAL SHOP OF J. B. ARNOLD & SON

site of the future postoffice and the block to the east between Elm and William were then covered with a rambling lot of shacks and wooden buildings. These housed the principal blacksmith, carpenter shops and stables. Below Pleasant Street, Andrew Daw ran his ninepin alleys, and near by stood Liberty Hall. Six blacksmith shops flourished where today there are about thirty, but more horses were owned in proportion to the size of the town. Brownell & Ashley were for some years the fancy horseshoers. Joseph Linton occupied the northwest corner of the lane and Pleasant Street. Here Mr. Luce spent his first two years at the forge. Most of the work was on carriages, and Mr. Luce did little horseshoeing until he set up for himself.

A fire, generally supposed to have started in a paint shop near by, devastated the two blocks in 1859. The old armory, four stables and many sheds furnished food for the flames. Mr. Luce then lived well out in the west end, and while he heard of the fire before going to work in the morning he missed the battle with the conflagration. Now came the present blacksmith shop on Mechanics Lane. It was the first building erected after the fire. A man named Smith built it for Mr. Linton, and under its roof Mr. Luce continued his apprenticeship.

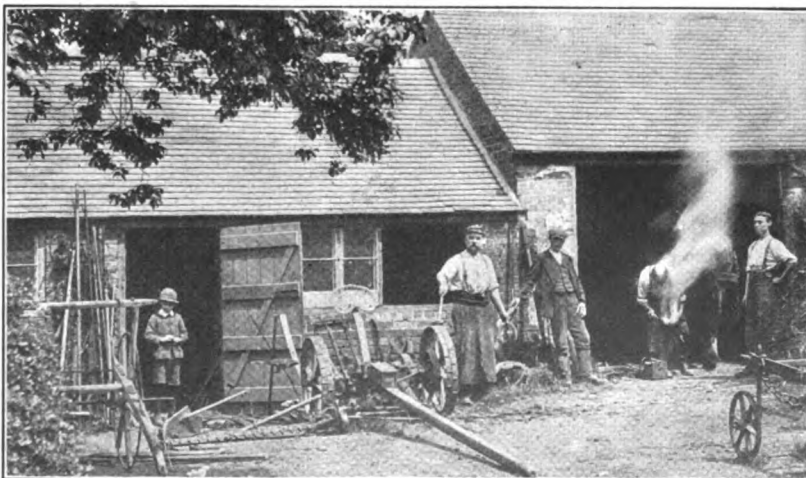
The four years' apprenticeship finally at a close, Mr. Luce went out to knock about a bit and see something of the country. For the most of five years he worked in different parts of the city. Among his

bosses were Andrew Smith, George L. Brownell and H. C. O. Cole. In the war days he went south to the government shops at Newbern, N. C. Newbern had been occupied by the Union forces some



AN ENGLISH SMITH'S HOME—MR. J. J. SHERWOOD'S COSY DWELLING

time before, and while Mr. Luce worked unceasingly for several months over horses, gun carriages and supply wagons, a glimpse of war was denied him.



THE SMITH-SHOP OF MR. J. J. SHERWOOD—AN ENGLISH SMITHY

Returning to New Bedford Mr. Luce in 1867 entered partnership with his old master, Joseph Linton. The year after the fire Sherman's stable was erected and from then on Mr. Luce watched building after building rise about the shop.

A blacksmith has no snap today; still the results of half a century of progress have considerably lessened their labors since Mr. Luce opened shop forty years ago. The day then, as now, began at seven, but while the smiths now quit work at five, they worked on until six. Much of the time pressure of work brought Mr. Luce and his assistants to the forge before six in the morning. The day of the machine-made horseshoe was just dawning. For years Mr. Luce forged his own shoes. Horseshoe nails were bought by the keg, but the blacksmith had to point them himself. Early prices for shoeing ranged from the fixed price of today, \$1.50, up to \$2.25. Mr. Luce always shod the many horses of the Perry stable. The four horses that drew S. F. Perry's overland stage to Bridgeport were shod in Mechanics Lane. The horses of the Fuller stage, first to Mattapoisett and later to Fall River, were also occasional visitors at his shop.

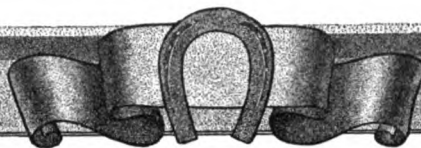
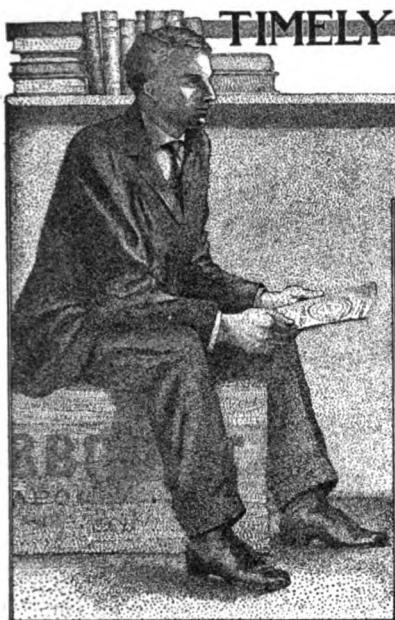
Throughout his long career Mr. Luce has never taken a real vacation. His days

off, total, he figures, less than three months. There is nothing more contagious than the interest generated when two or three horsemen gather around the blacksmith's stove on winter days. Trotters and pacers never go faster or smoother than around those comfortable red hot stoves. But despite his long service in this atmosphere Mr. Luce never owned a horse. Occasionally when Purchase Street became a snow-path and the fast steppers brushed on the course he would drop down to the foot of the lane and watch them. When the snow path was moved up onto County he failed to follow.

George Balden was with Mr. Luce longer than any other employee. Balden worked in the lane for twenty years. William Haney, who with Frank Tripp bought out Mr. Luce in 1909, was in the shop seven or eight years.

Just outside his door old buildings have crumbled away and been displaced by new. Strange faces and unfamiliar horses entered the shop each year, yet the forge fires blazed for fifty years. Without the city moved on and now it cannot be stayed. Mr. Luce has retired to his comfortable Cedar Street home, and the brick shop awaits its end.—*Standard*.

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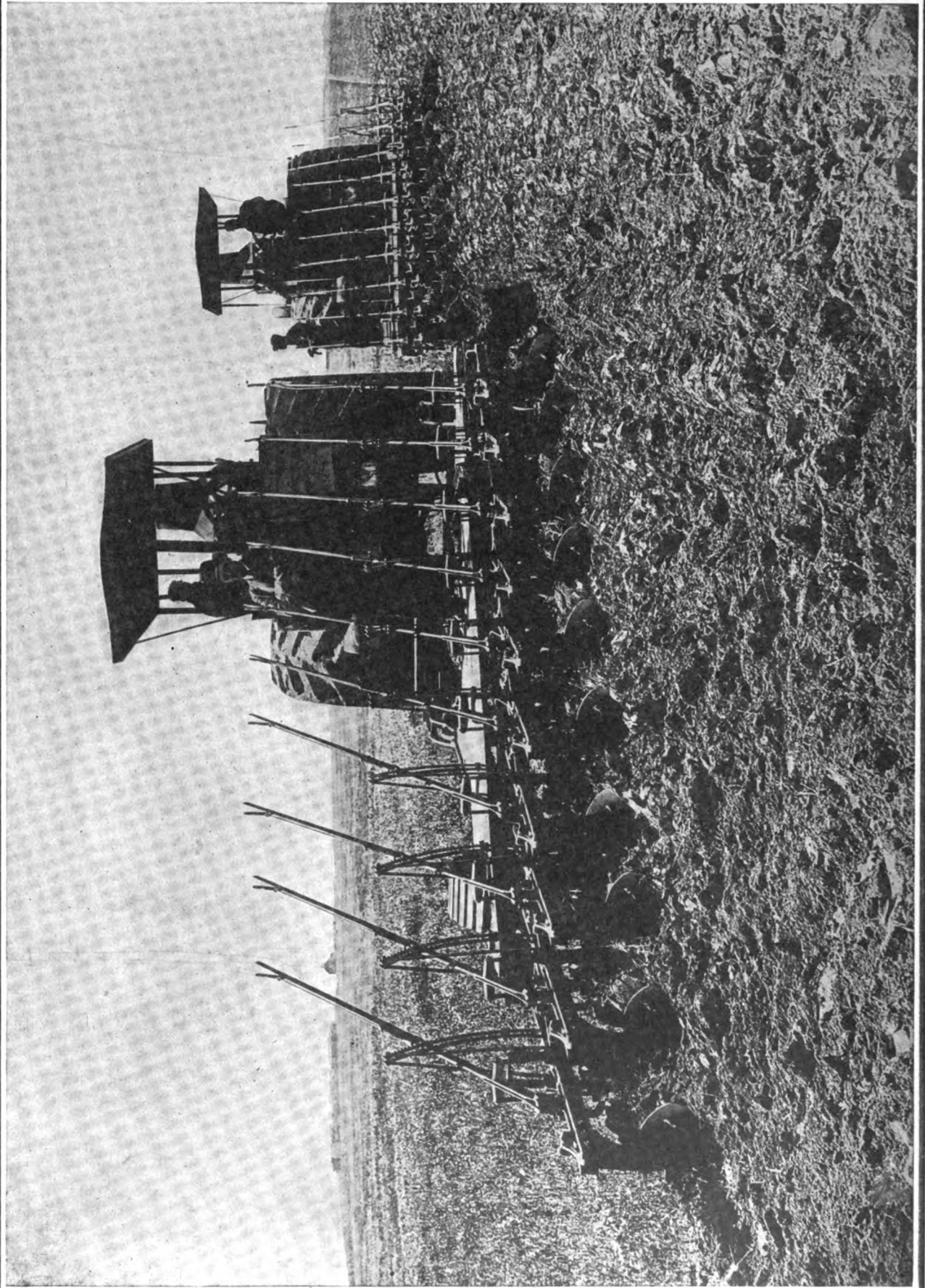
An Introduction

Many of you who receive THE AMERICAN BLACKSMITH this month will make its acquaintance for the first time. And to those of you who are introduced to "Our Journal" this month we want to say: that every issue of THE AMERICAN BLACKSMITH contains just as many reading pages as this issue. And in every other issue you will find practically the same amount of high grade, practical smith-shop information, written by writers who are recognized authorities in their respective subjects. You will find no puffs, stale clippings, advertising matter or material of similar low standard. Every article published in the pages of THE AMERICAN BLACKSMITH is published for the purpose of giving sound, practical, helpful information to the practical man. The writers in THE AMERICAN BLACKSMITH give "Our Folks" the results of their experiences—give them the hints, kinks and methods that have taken them many years to learn. As Mr. W. H. Evans of Ontario, Canada, says: "THE AMERICAN BLACKSMITH is of so much interest to me that I wish it were semimonthly instead of monthly. It has on several occasions saved me dollars in what would have been unnecessary labor and material. I have given several copies of the paper to mechanics and horsemen, and they speak very highly of it. I, myself, cannot say too much for the paper. I have since becoming a subscriber had several other journals sent to me, but these papers only show me how good THE AMERICAN BLACKSMITH really is."

THE AMERICAN BLACKSMITH brings the practical craftsman into closer touch with a better knowledge of craft matters—it solves the smith's daily problems—it gives him practical money-saving, profit-increasing information that can be used today on today's job. It gives the practical reader, once a month—twelve times a year—never less than 26 solid, practical, heaping-full pages of money-worth information. It doesn't give you the social news nor the political news, but solid, practical, usable craft news.

Be a Booster

Are you helping the craft all you can? Are you doing your part for all you are worth? Surely, a business at which you earn your living—the trade which enables you to eat, sleep, to live, to support and clothe a family—surely that trade deserves your support as a booster and not as a knocker. When you hear a brother craftsman or anybody else say something against the craft, you just get to boosting.



THE IRON HORSE OF THE FARMER SOMETIMES NEEDS THE BLACKSMITH'S ATTENTION



The Treatment of Corns

What They Are, Their Cause and Their Cure

E. W. P.

IT IS surprising to find the number of stablemen and shoers who think that there is some cure-all, some specific drug for corns. I have recently been favored with some recipes never known to fail (?), which will be of interest to your readers.

Prescription No. 1.—Pare out the corn down to the flesh, then saturate a piece of cotton wool with aqua fortis (nitric acid), and place it in the hole.

Prescription No. 2.—Pare out the corn, then fill up the hole with hot tar and tallow.

Prescription No. 3.—Pare out the corn with the drawing knife, then burn with a red-hot iron.

In the first place, I have not put any of these cures (?) to a practical test, and for obvious reasons I am not likely to do so; but I have seen horses on whom such empiricisms had been practiced, and in each case the corns were seriously aggravated, and in one particular case sloughing of the tissues and caries of the os pedis had resulted.

Cause and Effect

Again I must call your attention to the relation of cause to effect, for it is only upon an understanding of this fundamental principle that the shoer can scientifically apply his art to the cure of corns. Corns are so common in street horses that every horseshoer and horseman knows them at sight; but a large number of shoers and horsemen do not understand the physiological causes which

produce them; for, if they did, they would know that caustics, corrosive acids, or hot iron would do much harm instead of good. Then let us ask ourselves the question:

What Is a Corn?

A corn consists of a bruised condition of the tissues at the heels of the foot; the inside heel of the front foot being most commonly affected, sometimes both heels of the front foot, and occasionally it is met with in a hind foot.

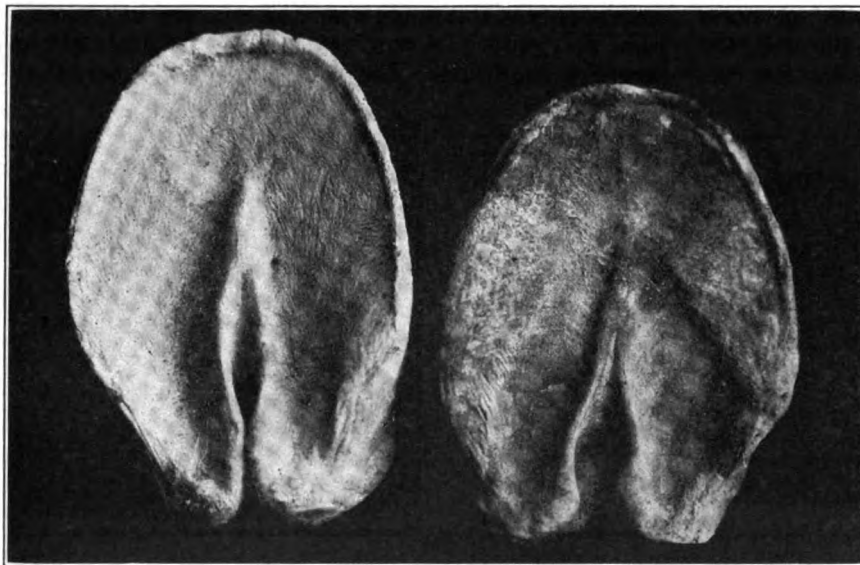
As a result of concussion to the sensitive tissues of the heel there is extravasation of blood, that is, blood

It is quite common for a corn to suppurate,—form matter—in which case if the imprisoned pus be not given free vent at bottom it finds its way along the course of least resistance and breaks out at the coronet. In old cases of suppurative corn, the horn at the affected part becomes black and cheesy. Occasionally you will see a case where the seat of corn is characterized by a deep black hole, which emits an offensive, watery discharge; this condition is usually the result of malpractice, from the application of the cures (?) above enumerated. When you pare away the horn

from the seat of corn and then apply a hot iron or some corrosive acid to the sensitive part, the horn-secreting tissue at that part is often absolutely destroyed and no more horn grows at that part. Instead, you have a hole emitting a discharge from the diseased tissue. Corns cause more or less soreness with loss of elasticity of step, or even lameness, more or less acute, according to the severity of the case.

Causes

Broadly speaking, the main cause of corns, like many other ailments of the foot, is to be found in the vast change of condition and work in the domesticated as compared with the natural state of the horse. The first and most important factor in the production of corns is our system of shoeing without frog pressure; next



A CONTRACTED HOOF AND A HEALTHY HOOF; SHOWING THE DIFFERENCES IN FORM

oozes from the capillary vessels and stains the horn red, so that a corn is known by the horn in the angle formed by the wall and bar at the heel being red. This blood stain may be limited to the size of a pea, or it may cover two or three inches in extent; it may be a bright red, or a deep, livid color, according to the severity of the case.



FIG. 1—AN EXPANSION SPRING APPLIED—SEAT OF CORN AT X

is the hard and unyielding nature of roads and streets, together with the pace we drive over them; third is paring the sole too thin and fitting the hoof to the shoe; fourth, the want of moisture; fifth, the use of heel calks, which accelerate concussion at the heel; and sixth, the use of seated shoes. Three or all of these factors may be acting together. Just think: if you take a colt from the pasture, in all probability the hoofs are stuffed with clay; the wall, the outer margin of the sole, and the

paper on the ground, set the foot upon it, draw a line around the hoof with a pencil, write the name of the horse and the date upon it, then file it away for future reference. Having prepared the hoof, the next thing we do is to shoe it in the ordinary way; that is, we proceed to put the whole weight of the animal on the wall (which was in its natural state borne by the sole, wall and frog); then we take him from the grassy pasture where his hoofs got a wet bath every night and put him in a dry stable, and when broken in he is sold to the butcher, grocer or baker who drives him from six to eight hours a day over the paved streets as hard as he can travel. Then, when your colt has done six months' street work, prepare the hoof in the usual way, get the diagram which you made at his first shoeing, draw another, compare the two, and you will hardly believe your eyes, the hoof is now so altered. The quarters are less round, and the heels are a quarter to a half of an inch narrower. Now a question suggests itself: "If this hoof fitted the foot when it was four and one half inches wide at the heels, how does it fit now that it is only four and one fourth?" This hoof, soft and tough when taken from the pasture, is now dry, hard, shrunken and brittle. The frog being

The Cure

Again I say to you—there is no specific, no secret charm, no patent lotion to cure corns. Just restore as far as possible the natural condition, just remove as far as possible the cause for the corn. The presence of a corn is readily detected by lightly tapping the wall of the suspected heel with a shoeing hammer. The animal betrays great pain when you strike the sore spot; there may be lameness with or without the presence of pus, but where there is pus the lameness is more acute even at a walk. The presence of pus may also be detected by pressing the coronet with the thumb, just above the affected heel. If the corn is slight and without lameness, rasp down the affected heel, wall and all, and shoe with a bar shoe or rubber pad; if the horse be lame, rest him, remove the shoe and poultice the foot with warm wet bran until the lameness has subsided; then shoe as directed. If there be pus, cut down the hoof at the heel and give it free vent, then poultice. If there is much contraction at the heels use an expansion spring after you have softened the hoof by poulticing (see Fig. 1). In some chronic cases it is good practice to dissect all the wall away at the heel right up to the coronet, thus laying bare the vascular structure for

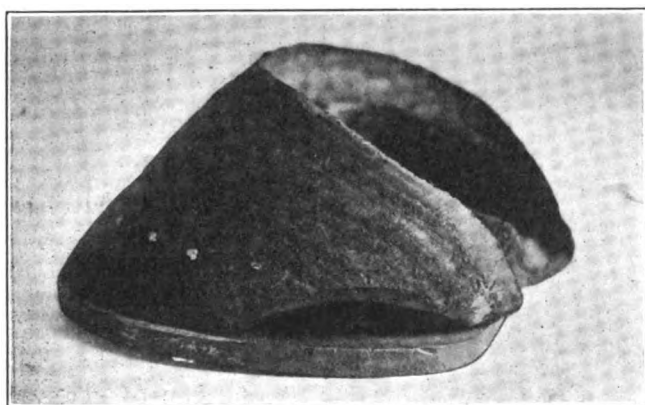


FIG. 2—SHOWING A FOOT PROPERLY SHOD WHEN A CORN IS PRESENT

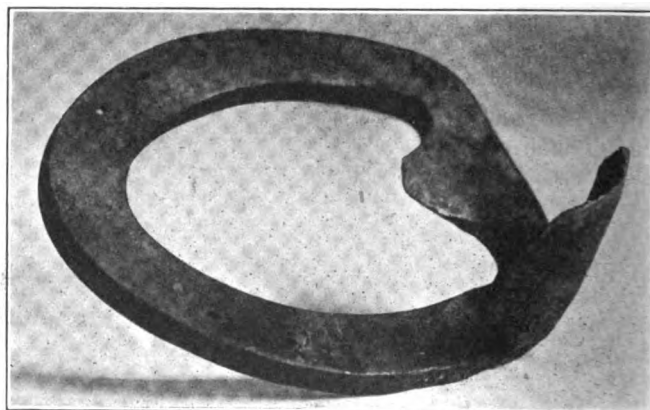


FIG. 3—A BAR SHOE WITH PROTECTIVE PLATE FOR DENUDED FOOT

bulbs of the frog are sustaining the greater weight of the animal. Now note the outline of the hoof. The quarters will be round, with wide-open heels, with a well developed frog, the texture of the hoof being tough yet moist; the frog and sole cut easily.

When you have prepared the hoof for the shoe, lay a piece of white

deprived of its natural stimulus of pressure is now dwindling; there is some contraction at the heels; the feet feel hot and dry, and the horse goes out sore first thing in the morning; the elasticity of step is gone; perhaps he stumbles; and when we rasp down the hoof at the heels we see the familiar red spot and know that he has developed a corn.

treatment. Don't be afraid to remove any diseased horn, but take care not to injure the horn-secreting tissue. If, however, the shoer is not posted on the anatomy of the foot he had better not attempt this operation without the advice of a veterinary surgeon. Having laid bare the inflamed tissue, poultice with antiphlogistine until the lameness has

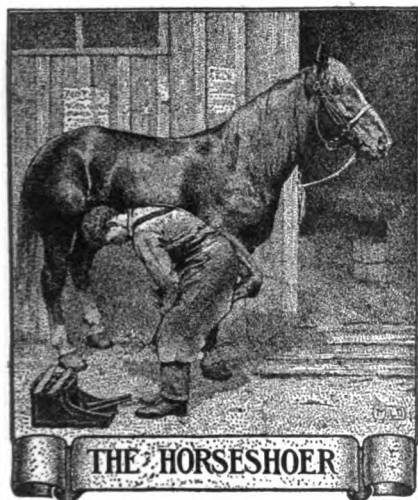


subsided, then shoe with a bar shoe and leather or a rubber pad (see Fig. 2).

Where this operation is performed, the animal may return to work as soon as the lameness has subsided and the foot is properly shod, but the part thus denuded of its natural hoof must be protected from injury by welding a thin plate to the heel of the shoe (see Fig. 3). As the new growth comes down from the coronet you will find it from $\frac{1}{4}$ to $\frac{1}{2}$ inch wider at the heel. When this new growth reaches the ground surface the cure is complete.

The main chance is to relieve the affected part of concussion; this is best accomplished by using a bar shoe, applied as shown in Fig. 2. It is of no avail to dig a hole in the seat of the corn. Cutting away the blood-stained horn does not cure the corn; on the contrary, by digging a hole you take away the support of the heel, thus facilitating further contraction. The only excuse for digging a hole is to let out imprisoned pus.

If all horses were shod with frog pressure by the use of bar shoes, and the hoofs stoppéd with wet clay every night, the number of corns and many other ailments of the foot would be largely reduced.



Cross-Firing and Knee-Striking

LESTER W. SIMS

The pacing horse only cross-fires or knee-bangs. As the pacer is gaited, and when going on a pace he virtually does but two things in the way of foot and leg interference; that is to say he cross-fires and knee-bangs. In other words, to make it plain and more



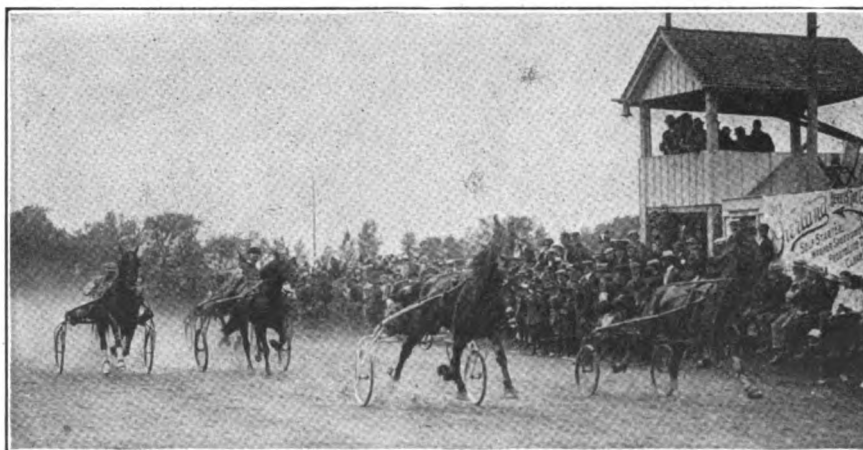
THE PACER EITHER CROSS-FIRES OR KNEE-BANGS WHEN HIS LEGS INTERFERE

easily understood, one side conflicts with the other side; the two limbs or feet on the same side never coming into contact with each other. While going on a pace, swinging back and forth at the same time, the two feet on the same side resembling, as they do, the pendulum of a clock. For instance, when the right fore foot is being folded up and back, so is the right hind one being folded up and back, and both are brought forward and extended at the same time; this leaving it clear in the mind of our reader that the pacer only cross-fires and knee-bangs.

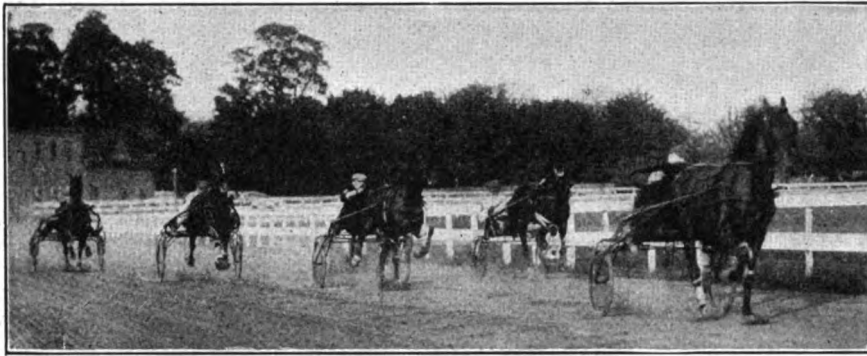
When the front legs and feet are in the act of passing each other they conflict. Only one or both may be offended; and knee banging varies to some considerable extent; depending, of course, very much on the amount of speed and action the horse has. One that is extremely low gaited

may only brush or strike the ankles or shin, others with more action—folding higher—will hit the knee and above it, striking the arm. But it is virtually one and the same thing, coming under the head of knee-banging.

Cross-firing varies to a great extent, depending, and owing to the relative amount of action in front, and in the hind limbs accordingly. Ordinarily the pacer is said to be cross-firing when he crosses over and in passing the front foot with the opposite hind one he bruises or brushes the inside heel or quarter of the front foot, often pulling the front shoe. This, however, is by no means the extent of cross-firing, and it may be done with one or both hind feet. In order to make the subject clear we will analyze in this way, using the left front and right hind in their relative positions: When the left



THE TWO FEET ON EACH SIDE SWING FORWARD AND BACK IN UNISON



CROSS-FIRING VARIES TO A GREAT EXTENT, DEPENDING UPON THE AMOUNT OF ACTION IN FRONT

front is in the act of being folded up and back, then the right hind is brought forward, extended and passes the left front. If, in passing, the feet or limbs come into contact or conflict it is, therefore, one of the various forms of cross-firing. To illustrate we will use for our subject one with excessive hind action but with little action and low gaited in front. One of this kind may go above the front quarter, striking the front pastern or on up to the ankle or shin, and it is known in some rare cases where pacers have hit their front knee with the inside of the opposite hind foot. Now we will reverse to conditions of a pacer with the extreme of action, folding high in front with less hind action. One with this type of gait will brush the inside of the hind foot at the coronet, as most pacers wear a coronet boot, but many of them go higher up, brushing the hind ankle and shin; some go so high as to brush the hock.

In conclusion: Because of these facts as set forth above there are designed as many different kinds of shoes of various weights and shapes as there are different-gaited horses. Every horse has his own individual

gait or way of going, and just some particular way of shoeing will suit that particular case better than any other shoe. I am reminded to say that there is a vast number or variety of hind shoes designed and used with more or less success (some luck) and called the cross-firing shoe, but one cannot always hope to be successful with any one of them, for the simple reason that the hind feet are not always entirely at fault. Supposing the front foot is being folded up, it is swung or paddles in, then of course it is sometimes as much or more at fault than the hind ones.

EDITOR'S NOTE—A succeeding article by Mr. Sims will detail a corrective treatment for the cases explained in the foregoing.

A Talk to the Young Horseshoer

DANIEL FERRON
(Reprint requested)

Young man, if you want to learn the horseshoeing trade and become a skilled horseshoer you must commence right. After you have engaged with a blacksmith from whom you intend to learn your trade ask him where his horse's feet are. Tell him

you would like to see the inside of a horse's foot, so as to have a better understanding of how to go to work on it. Probably he will tell you he hasn't any, and perhaps he never saw the inside of a horse's hoof, himself. Now don't think I am going to encourage you to disobey your boss, but, in this case, you get all four feet from the first dead horse you hear of. Cut them off at the knee. Bury one foot and leave it until all the flesh is gone from the bones. Take another one and put it in a kettle and boil it until all the flesh comes off. Take the third one and cut off at coronet joint. Then saw it in two lengthwise through the center of the frog. Cut the fourth one off at the pastern and cut the



E. M. MITCHELL A VERMONT READER PRESENTS A FIVE-YEAR OLD SHOE WHO NAILS ON A SHOE COMPLETE



A PACER THAT SWINGS HIS FEET FORWARD AND SIDEWAYS IS PREFERRED

frog out. Then cut the sole out all the way around close to the wall. After you have removed the sole you can see the sensitive part of the foot, toe bone, and navicular joint and the coronary joint. You can also see how the ligaments and tendons that run down the leg are connected around the navicular joint and how your nails should be driven without pricking or injuring the foot. It will also give you an idea of how thick the sole is. But you must remember that all horses do not have the same thickness of sole. You will learn this by practice. And always be careful in practicing to feel on the sole with your pincers to see whether the horse has a thick or thin sole. Some are so thin and light that you can spring



them with your thumb by pressing on the bottom.

I shall now say just a word in regard to paring the foot or getting it ready for the shoe. To pare the foot properly is one of the most important parts of horseshoeing. In the first place, never dig out or cut the bar which is back at the heel. One of the reasons that so many horses have corns is that many smiths do not know what the bar is there for, and they cut it or dig it out, taking all the support of the wall away from the heel of the foot and letting the wall break down. The shoe then rests on the sole, and in a short time the horse will have a corn.

Shoeing the Horse Correctly

RODGER L. STEVENS

The first thing to do when the horse comes into the shop is to observe the formation of the limbs from in front, behind and sidewise; taking particular notice whether he toes out or in and whether he tilts back on his heels or has a long, high heel and

a straight up-and-down hoof. After a careful examination of limbs and feet, see that the outer wall of the foot is perfectly clean. Next, raise the foot and see how the shoe is worn. Now carefully cut the clinches, and with pulling pincers well under the shoe take outside heel first, then inside heel. After loosening the shoe at both sides, draw the nails, so the pulling pincers will not injure the sole of the foot. Many feet are ruined by bad methods of pulling

shoes. Some men jerk and tug at the shoe without ever cutting the clinches, thus bruising the sole of the foot and tearing the wall.

The shoe being removed, the most difficult job now comes, i. e., to know how to pare the foot properly. This is one of the great secrets of proper shoeing. You have taken note of the formation of the limbs and the tilt of the foot, so if your horse rocks out, pare down the inside, then let the foot down on the floor and see if it stands level. If not, pare the rest when fitting the shoe. Be sure to get the foot level, so there is no space at the quarters between the shoe and the foot. Fit the shoe to the foot by having the shoe come to the outside of wall all around.



USE THE FINE SIDE OF THE RASP TO REMOVE THE LITTLE BURR RAISED BY THE NAIL

If the shoe has a toe-clip, heat the clip slightly, so as to burn a little at the toe. This will mark the place to cut out for the clip. I don't believe in too large a clip, nor in burning the horse's hoof, but the shoe may be heated a little when about to fit, so it is hot enough to sear the hoof a little. You can then tell whether the foot is perfectly level or not. If not, remove the high spot with a rasp, and by no means let the shoe bear heavy on the heels. Be careful in selecting the size of the nails, so they will not crack or split the wall. Also, be particular in driving nails. Get them of a uniform length. After you have driven all nails, strike each a blow so it fits into the crease, then take the clinch block and draw the nails carefully. Do not hit too hard and never draw too hard on the outside heels. Now nip the nails off quite short. It is not necessary to have a long clinch, and in a good solid foot it is not necessary to clinch at all. After the nails are clipped off, take the fine side of the rasp and remove the little burr which is raised out under the nail. Be careful not to let the edge of the rasp cut a furrow all the way around the hoof. A little just under the nail, so the nail will clinch down nice and smooth is all that is required. In clinching don't strike the hoof too hard, but strike the nail so it will



THE SHOE MUST BE CORRECTLY FORGED TO FIT CORRECTLY

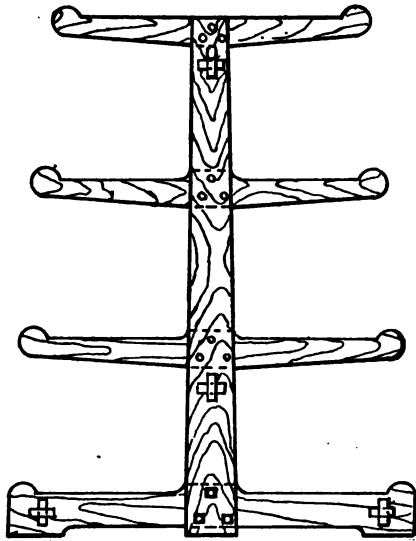


FIG. 1—END ELEVATION OF STOCK RACK

turn over easily. When done clinching, take the rasp and smooth down the clinches. As your shoe is fitted out flush to the wall, it will need little rasping. The wall is better if never touched with the rasp on the outside. If the enamel could be left on, it would be better for the foot. Now, all being done, let the foot down and see if you haven't improved the way he stood before you shod him. If he does not stand perfectly square, make up your mind that the next time you shoe the horse you will have him standing square.

to drive a shoe back to place, and hurt the horse very badly. You must remember you are not working on a block of wood. Read this carefully. Some will say this is old. I know it is old, but it will bear repeating, and should be put into practice more than it is. My reason for writing this article is, I have seen the horse's foot so much abused that at times I have had to turn my head. Some fellows pound the foot, draw down a half-fitted shoe on a half-pared foot, with neither shoe nor foot level; but the shoe is spiked on just the same. Still these men are allowed to shoe horses and cut prices.

Welding A Plow Point

ARTHUR LANGE

Make the point fit the plow share; then heat plow share and plow point, and when they are a good red take them both out and put a small piece of Laffitte welding plate between the parts where the lap is. Then, with a pair of tongs, squeeze the parts together, and they are ready to make a weld. In this way there is no slipping of the plow point and it can be turned in the fire, making a very nice job of it; and because it is solid saving ten to fifteen minutes' time on every point welded. Now I have welded hundreds of points, and have worked in Dakota where there is a



A Handy Stock and Material Rack

A. C. GOUGH, M. E.

It is usually considered better practice to use portable racks and tables for supporting stock and other materials rather than to place brackets upon the wall and out-of-the-way places. A rack used to support material, in order to be most convenient and economical of space, should be approachable from either side; both sides being arranged to support material.

A few years ago the writer designed and constructed a rack employing the principle illustrated in

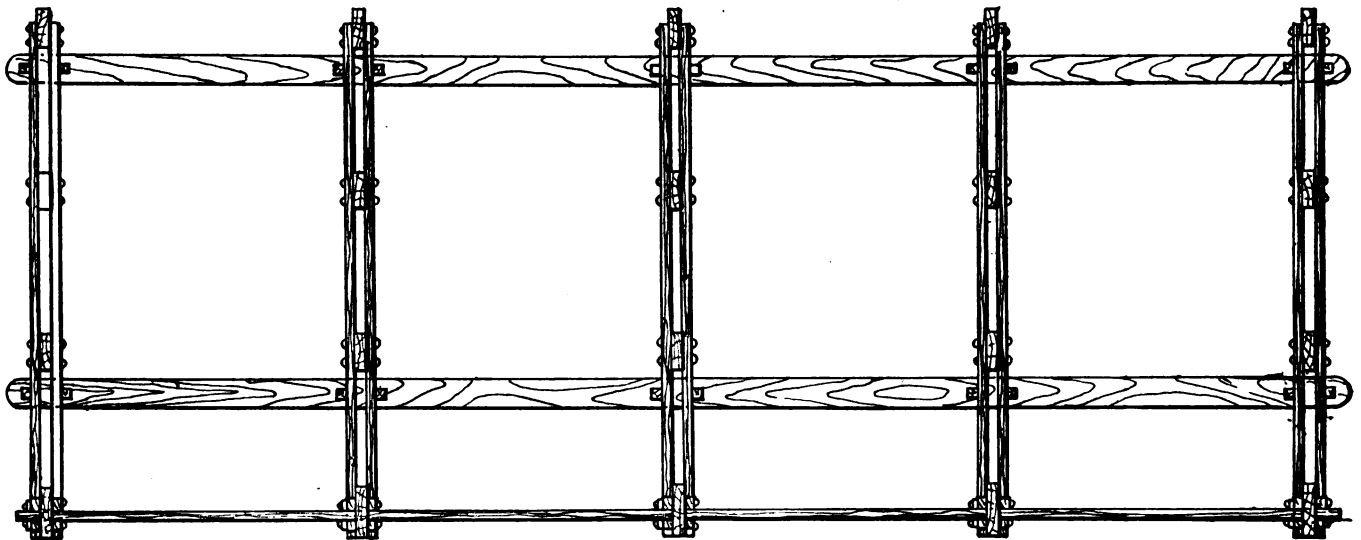


FIG. 2—A SIDE ELEVATION OF THE HANDY STOCK AND MATERIAL RACK

Mr. Horseshoer, remember when you are working on a horse's foot you are working on something that has life in it. The horse's foot is a very sensitive thing, so be careful not to strike it too hard. I have seen smiths strike a poor horse on the wall,

lot of that work done, and I have always seen and found it so myself that you sometimes have a little trouble in getting your first heat on so that the point won't slip off in the fire. Of course, some have tongs with which to hold the parts.

Figs. 1 and 2 and the accompanying working drawings. It has proved to be most satisfactory for the purpose for which it was designed.

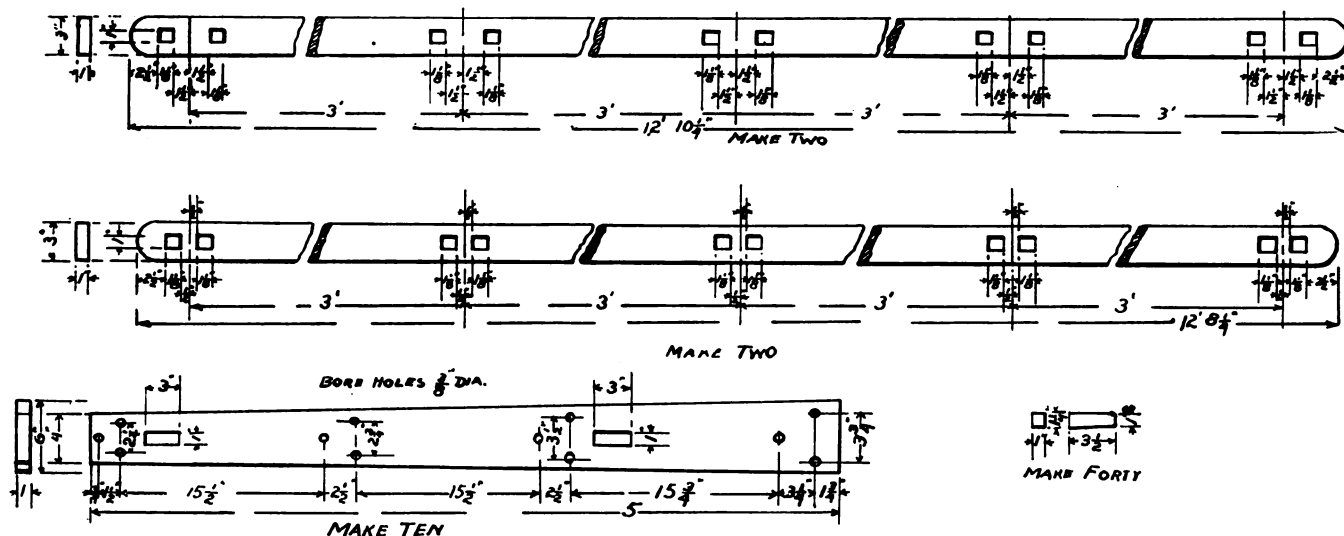
By using pins or bolts, about $\frac{3}{8}$ -inch diameter, the rack may be easily knocked down and again assembled



when necessary to remove the rack. The dimensions given here are reckoned to be suitable for supporting lumber or iron bars as usually required for stock in the repair shop.

The liveryman and garageman, who are probably the best judges of such matters, seldom if ever put anything more than good castile soap and water on leather tops; their contention

suet, melted and fused together. To this quantity add a tablespoonful of melted beeswax, beating the ingredients intimately into combination. The beeswax serves to cool out the



DETAILS OF THE HANDY STOCK AND MATERIAL RACK FOR THE SMITH-SHOP

The rack can, however, be made heavier or lighter as may be required for use under special conditions or for special stock.

How to Treat Carriage and Automobile Leather and Rubber Goods

M. C. H.

The carriage painter in the jobbing shop is specially interested in the carriage top, because to a greater or lesser extent he has much to do with this class of equipment—in cleaning it, dressing it with some mixture intended to prolong its days and keeping a vigilant eye on it while in service.

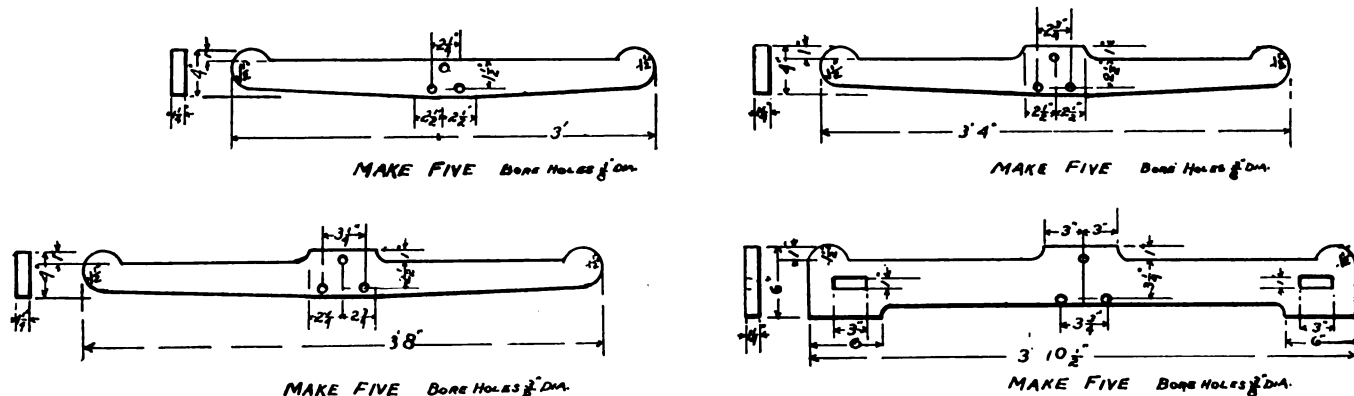
Of all tops, the leather top of first class quality is the easiest to care for and to maintain in proper condition.

being that if kept well cleaned of oil, acid and other possibly destructive accumulations, such tops will wear better than if dressed over with the ordinary materials made for the purpose.

However, there comes a time in the history of every top when a simple washing will not suffice—when the condition due to wear and tear demands some sort of a restorative, something to build up lost vitality. Even in such cases it is sometimes questionable if some sort of an oily mixture containing a certain portion of coloring matter is not preferable to a regular top-dressing. A dressing or mixture to be made by the painter for leather tops in the condition above described should consist of, say, 1-8 gallon of neatsfoot oil and 2 ounces of beef

leather and gives it strength, while the neatsfoot oil and beef suet impart softness and that elasticity to be desired in a carriage top. In case the enamel of the leather is badly worn and the general finish shows a bad state of wear it is desirable to darken this mixture with a drop of ivory black. First clean the top, using in all cases, if possible, castile soap and luke-warm water, and wipe dry. Then apply the mixture with soft rags.

Another formula used upon both rubber and leather, and especially machine buffed leather, when the top is badly worn may be made of 2 ounces of beeswax and 1/2 gallon of elastic body finishing varnish. Use the same proportions for making smaller quantities. Give this the proper depth of color by adding ivory



THE CROSS ARMS AND BASE ARMS OF THE HANDY STOCK AND MATERIAL RACK ARE EASILY CUT OUT BY THE PRACTICAL CRAFTSMAN



THE OLD SHOP OF THARP & SPANGLER. NO ROOM INSIDE FOR THE POWER PLANT

coach black. Then thin to a brushing consistency with turpentine. For a hand buffed leather top we would choose the first named mixture.

It will readily be understood, of course, that for a long life of service much depends upon the care and attention and treatment given the top by the vehicle owner and user. The painter has a responsibility in this matter which he should not evade, and by the performance of which he may win a certain prestige for his shop, and capture new trade. The vehicle owner and user should know through the medium of the painter that the leather top or any top is injured by being let down and, then, with joints broken, crushed together. This is a wholly unnatural position for the top and enforces a strain upon it quite out of proportion to its strength. This is the main

thing to be kept in mind in looking to the preservation of the top by the owner and user. Keep the top fully extended in its natural position. It is not too much to say that half the wear and tear of the top comes from the abuse of crushing the top together and leaving it in that position. Then, again, the top owner should be made to know that clean storage quarters are highly necessary to the preservation of the leather or rubber. Information along this line costs the painter nothing, and, like bread cast upon the waters, may return in the form of increased business.

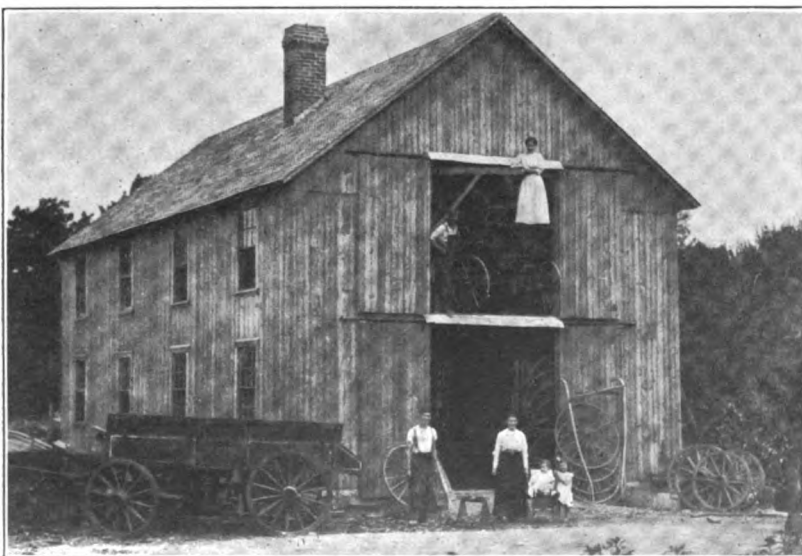
Some leather tops come to the shop considerably cracked, and in this condition an unusually soft and elastic finish is desirable. Such leather requires a special treatment, which may consist of sponging off with castile soap and water and then, after

drying out, apply with a brush the following:—Boiled linseed oil colored with coach black. Permit this mixture to remain upon the leather for about half an hour. Then with clean soft rags proceed to rub the mixture off. Continue wiping until a clean cloth shows no stain.

With the rubber top a different treatment for the most part is needed. The rubber top upon its first visit to the shop usually requires some sort of a dressing to preserve the enamel and bring about a finish to correspond to that upon the other parts of the carriage. This depends to be sure somewhat upon the weight and quality of the rubber used in the top, but it is safe to say that the average rubber top really needs a dressing of some rubber preservative. And when speaking of the top we include the storm apron, side curtains and all the rubber fittings about the vehicle. The grained leather or patent leather dash, trimmings, etc., require sometimes a mere cleaning up and polishing, first with common kerosene oil and then with clean soft cloths. Always wash the rubber top with the same care and thoroughness that is given to leather tops. With a 2½-inch, flat elastic bristle brush of good quality, soft in the stock yet firm in the strength of its bristles, apply the dressing sparingly, except, perhaps, in cases where the rubber is much the worse for wear, and offers a dry absorbent surface. Moreover, let the material be applied uniformly, which implies that the work should be performed by painters who know the value of good brush work and are competent.

There are so many excellent top dressings on the market quoted at a reasonable price that it is no longer necessary for the painter to make the dressing required unless he chooses to do so. Nevertheless, a good many painters prefer to make the top dressing they use and find it the most satisfactory practice.

There are numerous formulas, possibly some of which have been already published in these columns, but a new field of readers moves constantly into the foreground, thus warranting a possible repetition. To make a good serviceable rubber dressing, use ½ gallon of gear finishing varnish, a like quantity of turpentine, 2 ounces of beeswax and sufficient lampblack to give the mixture the proper color.



THE NEW OHIO SHOP OF THARP & SPANGLER. EVERYTHING UNDER THE ROOF AT NIGHT



Melt the beeswax and place all the ingredients in a closed can and mix intimately by shaking. This dressing is better if made up a few days in advance of actual needs, the can containing it being in the meantime repeatedly shaken, by which treatment it acquires a smoothness and a working property not otherwise secured. A dressing better adapted to cheap rubber tops which so often come to the shop in a bad condition, with the enamel of the rubber entirely worn off in places, the following formula describes: 1-16 gallon boiled linseed oil, 1-16 gallon coach japan, 1-8 gallon each of liquid asphaltum, gear finishing varnish and turpentine. Place these ingredients, along with $\frac{1}{2}$ pound of coach black in a can of requisite size, shake repeatedly for two or three successive days, to smooth out and better liquify the mass, and then use as required. Probably a further addition of turpentine will be necessary to thin out the dressing to meet requirements. In making these dressings it is well to observe the rule of using only the best materials. Odds and ends of this and that material do not make a reliable dressing and should not be used on leather and rubber.

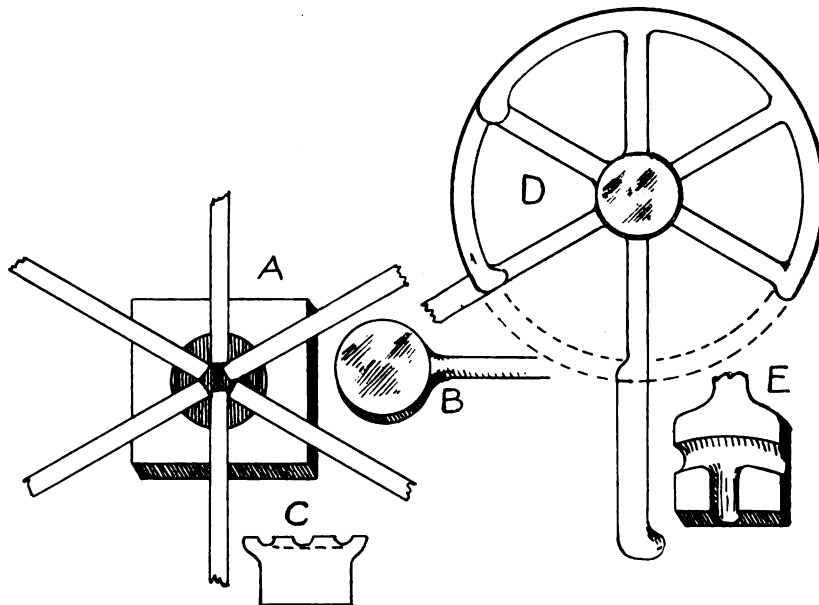
Tops and the leather and rubber furnishings upon reaching the shop should be assigned clean storage quarters, to which access may be easily had. A good strong rack is best, so constructed that two tiers of tops can be stored therein. By this arrangement the room space may be utilized to best advantage. Even the third space above the two tiers of tops may be used for storing the carpets, cushions, storm aprons, side curtains, etc. If no better arrangement offers, draw a curtain in front of this rack, which will materially assist in preventing the accumulation of dust, etc.



THE WISCONSIN GENERAL SHOP
AND CONCRETE GARAGE OF
MR. O. G. KLEIN

The top joints, bows and supports if badly worn will need attention as other parts of the vehicle are brought to a finish. The joints and supporting bows if chipped and fractured on their paint surface should be sand-papered, coated with lead and, when

engraving. Next six spokes were drawn tapering as in sketch, from $1\frac{3}{8}$ -inch round soft steel. The next step was to make a disc or round flat piece, 4 by $\frac{3}{4}$ inches, with a stem to it to make it handy to handle in welding; this was made



HOW TO FORGE A WHEEL OF IRON AND STEEL

- A—Hub and spokes in block, ready for block B to be laid on top and welded.
C—Grooved hub.
D—Wheel partly finished, showing work in various stages of completion.
E—Lower half of spring swedge for welding wheel rim and spoke.

dry, glazed over with putty reduced to a glazing consistency. A piece of pliable harness leather is useful to smooth out the glazing putty. A top never looks finished unless the metal fittings are finished up nice and smooth.

How to Forge a Wheel of Iron and Steel

BERT HILLYER

To forge a wheel of iron and steel like the one in the engraving appears at first to be a difficult job. A cast-iron wheel, 24 inches in diameter, 4-inch hubs, $1\frac{1}{4}$ -inch round spokes tapering to 1 inch, with rim $1\frac{3}{8}$ inch round, was broken in pieces, and a new one of iron and steel was forged in eight hours by the following method: First, a block was found with a 4-inch hole in it by 3 inches deep. Next a piece of round iron, 4 inches in diameter by $4\frac{1}{2}$ inches long, was cut from the bar and six grooves deep enough to lay in a piece of $1\frac{1}{4}$ -inch round iron was made as in

of iron. Next four smiths were shown and drilled just what to do, because all of these eight pieces had to be assembled and welded in one heat. The iron parts had to be heated to a soft white heat, while the soft steel spokes were heated to a very light welding heat. Each smith to heat two pieces. When the heats were ready, each man went to the steam hammer. The hub was placed in the hole of the block first mentioned, the six spokes laid in the grooves and the flat round piece on top of them. The whole thing was welded up with two or three blows from the hammer. The steel spokes being hard and the iron soft it drove in tight around them, making a sound weld. After this heat, one smith alone (with a helper) finished up the job. His next step was to cut out the surplus metal between the spokes with a gouge and true up the hub. The part of rim was then bent around to the other spoke and welded in a spring swedge that had the impression of spoke and rim.



This is a quicker way than making them from the solid as I explained once before and it makes a neat job.

Stopping the Leaks

A. M. BURROUGHS

Over-Weight and Over-Measure

Food Inspector Ottesen of Iowa, while checking weights and measures at Waterloo, Iowa, found five grocers whose scales gave over-weight.

These five pair of scales, Ottesen said, "long weighted" each of these grocers out of hundreds of dollars every year.

One grocer was selling about 50 lbs. of lard a day, at $\frac{1}{4}$ ounce over-weight. This one leak, on one kind of goods, aggregated about \$40 a year.

Bad Buying

The average merchant is a poor buyer. Ninety per cent of all small business men over-buy. The biggest leak is in the failure of the business man to turn his capital often.

He should keep accurate records; then he will not be likely to duplicate the mistake, even if he doesn't prevent it the first time.

A jobber's discount of 50% from list price is a loss if the goods will not sell. The retailer must not buy for the *extra discount*, but for the *profit*.

Incompetent Help

Every employee should be put on a merit basis. The clerk who isn't able to sell goods at a profit is incompetent and unprofitable. Keeping him is like letting the faucet remain open in the oil barrel—only it is *profits* and not *oil* which are leaking.

Failure to Charge Goods Sold On Credit

When a sale is made on credit and no record is made of it you stand to lose the profit you should make on the sale; the time which has been invested in the buying; the time invested in the selling of the goods; the cost of the labor of handling the goods; the cost of keeping them, and several other losses, including the big loss which the carelessness will cause in other work.

Wasteful Bookkeeping

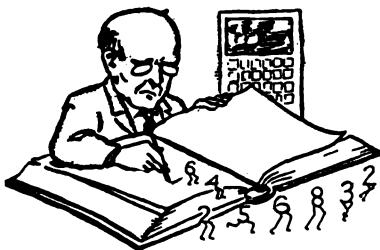
It costs more money sometimes to keep incomplete records in an unsystematic way than it would cost to keep complete records in the right way.

The bookkeeping system should be up to date. It should be carefully

worked out. It should be especially designed for your particular business. It should give the exact information needed, as economically as possible.

Errors in Adding Figures

The amount of money lost in the average business every year through mistakes in figures is enormous.



IF SOME FIGURES ESCAPE, IT'S A POOR SYSTEM

A customer gets his bill. It is a little less than he expected, but he thinks possibly he made a mistake. He pays on your figures.

If it happens to be a little *more* than he expected he asks you about it, and *you* spend some *valuable time* finding the error and correcting it.

If you make a mistake in your figures you are sure to lose, whether it is against you or against the other fellow.

Figuring Profits Wrong

A recent investigation conducted by the Burroughs Adding Machine Company showed that fully 75% of all retailers figure profits on a basis which gives them 3% to 8% less than they think they are getting; often figuring themselves out of any profit.

This is the vital end of a business. What is the use to sell goods if profit—the whole purpose of selling—is lost in bad methods of figuring prices?

Failure to Charge All Expenses

All expenses are going to come out of the gross profits, whether they are put down as a part of the cost of doing business or not.

If a man pays out \$20 a month for rent, he will not find it to his credit in the bank at the end of the year; even if he doesn't charge it into the expense of doing business.

The same applies to every kind of expense in the business. Every one of the leaks mentioned in this chapter is an expense, whether you charge it as such or not.

It is better to err on the side of too liberal charging of expenses and find an unaccounted-for balance in

the bank than to find a puzzling deficit, caused by not charging all your expenses. The deficit may disable you just when failure to pay a big bill means bankruptcy.

Failure to Discount Bills

If you turn your capital every week and discount all your bills at 2%, the clean profit from this source alone amounts in a year to a sum greater than your capital—52 times 2% is 104%. If you don't take the discount, you lose it, of course.

Presents, Donations, Etc.

Possibly some of this is necessary. Some business men make it a matter of considerable expense. It is a leak which should be carefully watched.

If you give away an amount equal to only 1% of your gross business in that way, you stand to lose \$500 a year on every \$50,000 a year of gross business.

Wasted Time

A smith hired a man capable of doing \$200 worth of work a week. Bad management wasted half his time and he did only \$100 worth a week. The smith lost the profits on a gross annual business of \$5,200—\$100 a week.

When you hire a man, you simply buy a certain amount of his time, to be used as you direct. If you direct wrong, or he wastes part of his time, you lose.

Time can be wasted in a thousand ways. Most of these are under the control of the employer.

Most of the waste of time is caused by bad methods controlled by the owner of the business.

The Reduced-Price Leak

When goods are marked to sell at \$1.00 and it is necessary for any

reason to cut off 10%, the reduction from the marked price represents a loss.

If the cut is necessary to make the goods sell, it is a loss due to bad

buying. It also produces another loss by giving customers the impression that the original price allowed an enormous profit.

Wasteful Advertising

One smith used space two columns, ten inches deep, in his weekly paper



TIME CAN BE WASTED



to run a poorly worded and poorly arranged announcement. It cost him \$200 a year and produced almost nothing.

A competitor used half as much space and changed his advertisement every week, using strong selling arguments. He doubled his business in two years.

Advertising, properly directed, is one of the most productive expenditures of the modern business, but



A BUSY DAY AT A CANADIAN SHOP
MR. W. H. EVANS OF ONTARIO
DOES ALL KINDS OF GENERAL
SMITHING

misdirected advertising can be very wasteful, or even harmful.

Arrangement of Equipment

In a certain shop each man had to walk all over the shop to do his work. A re-arrangement stopped this and cut out about two hours' wasted efforts for each man each day—about \$600 worth of time in a year, considering the several men. This time, which cost money, was profitably used.

Extravagant Use of Supplies

Books, blanks, office stationery, statement forms, blank books and pens, ink, pencils, etc., cost a neat little sum in a year. A big saving can be effected by proper care and a leak is pretty apt to follow lax method.

Then, too, fuel and iron, steel and wood stock can be used extravagantly. Welding compound, horse-nails, calks, shoes and pads; all these cost money and when wasted eat into profits.

Mistakes

Employees working at small salaries are usually careless, inefficient and thoughtless. They make enough mistakes any time, but when tired they make more.

Unless they work under the direction of a system which makes their work pretty near mechanical, and a close check is kept on their mistakes,

they will likely do as much harm as good.

Dissatisfied Customers

A regular customer is worth considerable in a year to the average business. Some customers are worth more, some less.

It is very easy to drive customers away. Often it is hard to get them. It is easy to lose a big amount of money through the careless handling of customers.

Spoilage

A careless employee will spoil a very large amount of stock in a year, cutting deep into the profits. Even a careful employee is pretty sure to spoil some.

Bad Accounts

To be sure of collections, the merchant must have accurate and complete records. The slow-pay customer may not remind you if you forget his bill.

If he asks you for a statement some day, when he has the money, and you can't give him the exact figures at once, then it's your loss if he spends the money for a vacation trip.

Leaks in Your Business

The leaks suggested here apply to your business. Some of them may cause you only a little loss. Some may be swallowing about all your profits.

A smith who is not now in business (we'll call him Smith) fooled himself for a time into thinking that he wasn't losing anything through leaks in his business. He refused to see the leaks.

"I watch things pretty close," he said, "and I know just what it costs

me to run my business. Jones, down the street, is a crank on digging out expenses to charge up against his business. Not for me!"



THE SHERIFF PAYS
A VISIT

Jones has the exclusive business for his section now and is very prosperous. The sheriff closed out Smith's business over a year ago.

Remember this: All leaks and other expenses in your business have to be paid at their full face value, whether you see them or not.

If the sheriff gets your business, don't let it be said that he got you because you *guessed* at your expenses.

(Copyrighted, Burroughs Adding Machine Co.)



Brains and Sawdust

How often you hear the expression "I didn't think," when a person is accused of some foolish or tactless action.

And yet how many, many business men "don't think" as they should about their business. Their brains are like so much sawdust, as far as their real use to their business is concerned. They simply plug along doing the same unnecessary things, using the same goods, buying from the same firms—just plugging, plugging along, somewhat as the old family mare plugs along toward home—half asleep and finding the way because of having been over the same road so often.

There are lots and lots of smiths going down this road of easy resistance—not because it means more profits or more business, but because it requires the least amount of real thinking. They get into the habit of doing things certain ways, and while at first they may have been somewhat in doubt as to whether or not some certain method was correct they very shortly get so in the habit of doing the thing that way that they are sure it is the only way.

And you'll find smiths doing business just as their fathers did before them and as their grandfathers did before that. The business was started for them, and of course the easiest way is to simply keep the business going along right on the same old track.

On the other hand there is the business smith with brains and who knows how to use them. He thinks twice before doing a thing once, instead of doing it twice and thinking once. His mind is open to new ideas, new stunts, new methods. He is the smith who buys of a certain firm, not because his grandfather did, but because that certain firm gives him what he wants when he wants it and at the right price. The smith with live, thinking brains is the chap who is taking on such other work as he can fit into his regular lines—he's the man who works his brain first instead of last—who allows his brain to tell him what to do and how to do it first instead of questioning why he did it wrong after doing it unthinkingly.

The smith with a working brain is analysing his smithing and business problems, he is asking questions about his business and getting the answers.

If he is doing a good business, but apparently making no progress, he seeks out the reason, and after a careful investigation tries to remedy the fault.

NOTE—This is the fourth talk of a series by the Editor. Each talk is complete in itself, but bears an intimate relation to business, prices, profits and costs. The fifth talk, "What Ails Business?", will appear next month.



The Man Who Didn't Know

W. O. B.

"Ever notice how many things that you thought couldn't be done are being done by some chap who didn't know they couldn't be done."

—Heats, Sparks, Welds—December, 1912

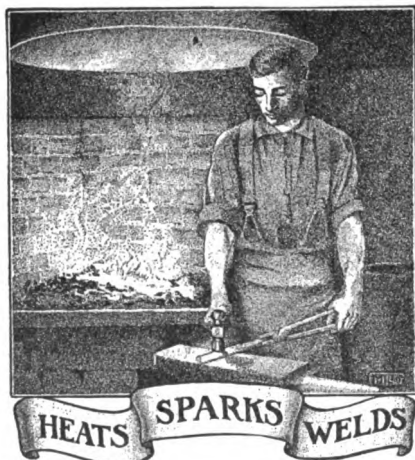
"It cannot be done—at least not that way."
But the man, with a chuckle, replied:
"I really don't know, so I cannot say,
An' I never will know 'till I've tried."
So he waded right in
With the trace of a grin
On his face—if he worried he hid it,
An' he started to sing
As he tackled the thing
That couldn't be done, and he did it.

Somebody cried: "Oh! you'll never do that.
At least no one ever has done it."
But he took off his coat and he took off his hat,
And the first thing they knew he'd begun it.
With a lift to his chin
And a bit of a grin
He begun—if in doubt, why he hid it,
As he tackled the thing
He just started to sing—
"It couldn't be done"—but he did it.

There are thousands who say: "It cannot be done."

There are thousands to say: "You will fail."

There are thousands to point out to you one by one
The dangers that await to assail.
But you just butt in—
On your face stick a grin—
Take off your coat and go to it.
Just whistle or sing
As you tackle the thing
That cannot be done, and then do it.



Happy New Year

May each succeeding day of this new year find you with sufficient happiness, health and wealth to make you appreciative of God's Good Gifts.

Did you celebrate Christmas in the proper spirit?

A man who is ashamed of his business will soon have a business of which he SHOULD be ashamed.

On the average, few men are ever "fired"—they fire themselves. A man is seldom "let go" for doing his work right.

If you have made someone happy beside yourself, then and not till then has life been worth the living.

No, figures don't lie! But some folks find it mighty easy to group them so as to back up their "hot air."

Don't make excuses, make good—and if you can't make good, make room for the man who can.

Which is worse, to be able to do the work and not have it to do or to have the work and not know how to do it?

The smith who allows himself to be "stumped" by the same job twice is a poor business man and a poor smith.

Yes, Thornton will be with us again in February. A brand new series that will make you sit right up and put new life into your business.

Life's worth while if you but smile; for while you smile, another smiles; and soon there're miles and miles of smiles—so smile a while.

Funny, how some folks flare up when they're accused of something they didn't do, and how they smile when praised for something they couldn't do.

The best anti-freeze mixture is the calcium chloride solution, if the radiator is leaky; but if it is tight, equal parts of wood alcohol and water is the best. F. H. D.

If you sold your goods and services as you purchase from jobbers and manufacturers would you be selling for cash or credit?

Don't be a clock and let the minutes merely swing around you. Make the most of your minutes and you will make the most of your life.

Some folks would get along better—everything and everyone concerned—if instead of trying to revolutionize the world they would try to earn an honest living.

Don't let the question, "Is it cheap?" decide your purchases. "Can I sell it before the interest on the money invested eats up the profit?" is the question that decides.

Are you a member of the B. L.? No, not Boiled Lobsters—Boosters' League is what we mean. Better get to boosting. Boost and the craft boosts you. That's the spirit.

In case of shortage of lubricating oil use castor oil in the bearings and mix a pint of glycerine with a pint of kerosene and place this in five gallons of gasoline. This will make the cylinders safe.

Don't overlook that prize contest announced on page 102. You'll want to get hold of that fifty dollars, and there's no reason why your letter cannot secure the prize as well as any other.

When grinding brass and the softer bronzes, and in order to obtain a finish, the wheel must be as fine as the finish requires. Bronzes with "manganese" or "phosphor" admit of coarser wheels.

"Perhaps it's bad professionals that make farmer blacksmiths," suggests Cason of Indiana—which leads to the remark, which is worse—a poor professional or an expert farmer blacksmith?

Are you getting all you should out of the articles on business system? There is room for improvement in smith-shop systems and room for profit, too. Read these articles, and better both your system and your profit.

When you get to thinking pessimistically about the trade, just shut your eyes, wrinkle up your brow and think—ten, twenty years ahead. Then, with the searchlight of the future to guide you, get busy.

"A horse is not known by its trappings, but by its qualities" said Socrates, centuries ago; and the same is true today, with the added fact that the shoer can very materially improve the qualities by proper shoeing methods.

To our query, Tom replied: "Business grew some,

But my profits have flew up the flue some.

While my prices are high

Costs are also near by."

Tom's business must surely be gruesome.

Of these two smiths, which is more likely to succeed in business—one who spends his winter evenings studying out a new opening in a game of checkers or the one who studies the location of the letters on the keyboard of a typewriter?

DEAR EDITOR:—Don't you think you've picked on Tom Tardy long enough?

Look into the shops of Dolittle & Seemore and into Street & Walker's—they need a little jacking up.

You must admit, Tom has done quite a business, or you would more easily find your way to his office.

Let me know when you call at Tom's shop again, and I will help him put things to rights—and then we'll all go fishing together.

JACK EVEREADY

And now at this time—the beginning of a brand new year, a year no one has ever seen or lived in before—let us undergo a MENTAL house-cleaning. It is an excellent time for new ideas as well as new ideals; for new resolutions as well as dissolutions; for preparations as well as reparations.

Those prizes are certainly worth writing for. The fifty dollars will certainly be acceptable to anyone. The watch is guaranteed—has a seven-jeweled movement in a ten-year case; and the fountain pen is guaranteed by the well-known makers of a well-known pen. Write a letter and get fifty dollars or a gold watch or a fountain pen. Why can't you do it as well as the next fellow?

Try this on your next "slow payer": "Mr. Brown, this is the day you promised to pay that bill. My credit depends upon my being able to pay my bills promptly. I cannot do it unless my customers settle with me as they agree. If you haven't the money, there are banks in town for the very purpose of accommodating men in your situation—but I am not in the banking business."

Are you pocketing some of the money that is being spent for automobile repairing? Better get some of this business—it really belongs to the smith. Keep in touch with the times. Do as old Tom Barker did. He started in business years ago in a little old shack with a line of oil lamps, wicks and candles. His business grew, and when gas was installed in the town he sold gas fixtures and globes. The Barker Company today, run by Tom's two sons, are dealers and contractors in electrical supplies and work. Keep up with the times.



Our Honor Roll

Forty New Names

Just forty new names have been placed on Our Honor Roll since last month. Just exactly forty of Our Folks have paid their subscriptions up to or beyond December, 1915—to say nothing of the hundreds who have paid to nearer dates. Altogether there are over three hundred fifty names on Our Honor Roll—350 subscribers paid up to and beyond December, 1915. Look at the long list paid to 1916 and to 1917. Look at that 1922 class—it's still growing and room for more. Then, also, note that Mr. Watt still holds first place, being paid to December, 1930, while Mr. Stites still has second place.

If you are unacquainted with Our Honor Roll, we want you to ask about it. Ask any questions you wish about this subscription insurance. You see, it works just like life insurance or any other insurance. For example: suppose Jones wishes to subscribe for five years—he sends us three dollars (domestic rate) and we credit his account for five full years. Now suppose Jones dies at the end of three years—promptly upon receiving notice of his death we refund to his widow or heirs the difference between the five-year rate and the three-year rate. You see, Jones still gets the long-time rate on the period for which he received the paper, with the possibility of getting even a better rate had he lived.

It's easy to get into the 1923 class if your account expires this month—January, 1913. Just send a remittance of \$5.00 (\$7.00 in Canada—£1 14s. in other countries) and receive ten years' credit, marking your account paid up to January, 1923. Do it now and get into the 1923 class before it gets crowded.

	U. S. and	Mexico	Canada	Other
Two years	\$1.60	\$2.00	10 shillings	
Three years	2.00	2.70	14 shillings	
Four years	2.50	3.20	18 shillings	
Five years	3.00	3.75	1 pound	
Ten years	5.00	7.00	1 pound 14s.	

You can also gain a place on Our Honor Roll by getting new subscribers. Show this big list to your brother craftsmen. A paper must be pretty good to get a practical man's subscription years and years in advance. Send in the new subscriptions and we will give you six months' credit on your account for each new order. Will you tell your neighbor?

NAME	Subscription	NAME	Subscription
W. C. WATT, Kan.	Dec., 1930	SCHOLLER BROS., Ind.	Nov., 1917
I. J. STITES, N. J.	Jan., 1928	E. M. WURSTER, Mich.	Nov., 1917
W. R. TURNER, Man.	Oct., 1923	S. Z. FREY, Ind.	Nov., 1917
T. BRADLEY, N. S. Wales	Mar., 1923	B. A. STEINKE, Ohio	Nov., 1917
W. BRECKNER, Okla.	Dec., 1922	J. N. BATHGATE, N. Dak.	Nov., 1917
L. O. LEURS, Ill.	Nov., 1922	J. W. RAPS, N. Y.	Oct., 1917
W. LAWSON, N. Z.	Nov., 1922	W. C. RONEY, Pa.	Oct., 1917
H. J. WYATT, Wash.	Sept., 1922	J. N. MILES, Ky.	Oct., 1917
J. N. SKOW, Ia.	Sept., 1922	W. A. WILSON, N. Z.	Sept., 1917
A. D. STANDFORD, Wash.	Sept., 1922	R. ROSS, N. S. Wales	Sept., 1917
T. TEMKIEWICZ, Que.	Sept., 1922	I. E. SPROUD, Me.	Sept., 1917
A. PFLEIFER, Ohio	Aug., 1922	J. P. KOENIGS, S. D.	Aug., 1917
J. ERMAN, Ark.	July, 1922	C. L. HOCKETT, Cal.	Aug., 1917
W. K. W. HANSEN, Pa.	June, 1922	H. C. STENZEL, Tex.	Aug., 1917
ROBERT TOCHTER, Cal.	June, 1922	M. DEJAGER, S. Africa	Aug., 1917
J. VAN MARTER, N. Y.	June, 1922	F. HOWARD, Kan.	Aug., 1917
E. ANDERS & SON, S. Aus.	May, 1922	H. FERREL, Ill.	Aug., 1917
LOUISA CARLAGE WKS., Va.	May, 1922	J. McMEEKEN, N. Z.	Aug., 1917
S. SMITH, Tex.	Apr., 1922	F. H. GIERKE, S. Aus.	Aug., 1917
J. W. HAAE, Ia.	Mar., 1922	F. G. STONE, S. Africa	July, 1917
E. A. DILLON, Nev.	Mar., 1922	H. J. DEVONSHIRE, N. Z.	July, 1917
D. W. SMITH, R. I.	Mar., 1922	V. J. HUBBARD, N. Y.	July, 1917
D. F. KUSTER, Wash.	Mar., 1922	W. R. GELLING, S. Africa	June, 1917
R. H. KEITH, Ia.	Jan., 1922	J. H. BAKEBERG, S. Africa	June, 1917
O. M. JOHNSON, Minn.	Oct., 1921	A. R. HALLENBECK, N. Y.	June, 1917
H. FELDUS, Neb.	Sept., 1921	F. C. BOCK, Neb.	June, 1917
W. K. KLINE, Kan.	May, 1921	YOST & HALVORSON, Minn.	May, 1917
T. P. CONSDINE, Mass.	Dec., 1920	W. MCCOY, Kan.	May, 1917
ED. GRIMM, Tex.	Mar., 1920	A. GUSTLEY, Tex.	May, 1917
R. S. CRISLER, Ky.	Jan., 1920	C. F. J. LORENZ, N. Y.	May, 1917
I. M. TOWNSEND, Cal.	Apr., 1919	A. DATWYLER, Ohio	May, 1917
C. WILLIAMS, W. Aus.	Mar., 1919	H. G. MARRIOTT, Utah	Apr., 1917
A. B. WENDLANDT, Wash.	Sept., 1918	E. THIBAudeau, Wis.	Apr., 1917
A. J. BROOKMAN & Co., Vic.	Sept., 1918	W. PICKERING, S. Africa	Apr., 1917
PETER COCKS, W. Aus.	Sept., 1918	ED. BURROWS, England	Apr., 1917
R. J. TOMPKINS, Tex.	Sept., 1918	L. KAUSCH, Wis.	Apr., 1917
A. DISCHER, Aus.	Aug., 1918	J. M. BROWN, Tex.	Apr., 1917
ALBERT MELLUM, N. D.	June, 1918	J. C. WOODS, W. Aus.	Mar., 1917
H. L. HASWELL, N. C.	May, 1918	C. BOULTON, N. S. Wales	Mar., 1917
R. COLVIN, Ind.	Apr., 1918	C. A. HAWKINS, Ore.	Mar., 1917
D. C. HOUCK, Ohio	Mar., 1918	A. L. MONTGOMERY, W. Va.	Mar., 1917
RICHARD BRENNER, Tex.	Feb., 1918	J. PETERSON, Ia.	Mar., 1917
W. F. HILL, N. C.	Feb., 1918	J. ANDERSON, Tas.	Mar., 1917
P. J. DALLY, W. Aus.	Jan., 1918	A. J. NEILL, Vt.	Mar., 1917
J. MORROW, Pa.	Jan., 1918	ED. DEITRICH, Ind.	Mar., 1917
G. J. SAUER, Mo.	Dec., 1917	LEWIS CHASE, N. Y.	Mar., 1917
MESS BROS., Vict.	Dec., 1917	E. O. LEE, S. Dak.	Mar., 1917
KAYE & ANLEY, Eng.	Nov., 1917	S. STEMPLE, Ohio	Mar., 1917
T. H. ZIEGLER, Wis.	Nov., 1917	R. S. GUGISBERG, Kan.	Mar., 1917

NAME	Subscription	NAME	Subscription
J. S. HASKELL, Col.	Mar., 1917	H. M. FINGAR, N. Y.	July, 1916
W. L. ROARK, Tex.	Mar., 1917	L. H. STRANGE, Vict.	July, 1916
A. R. BARLOW, Tex.	Mar., 1917	P. O'DONNELL, Vict.	July, 1916
C. A. WHITACRE, Ohio	Mar., 1917	R. J. HANCOCK, N. Z.	July, 1916
B. P. CARNEY, Ill.	Mar., 1917	F. G. WILSON, Calif.	July, 1916
A. J. H. WEGENER, S. Africa	Feb., 1917	I. H. HALL, Ind.	June, 1916
H. SCHNETTE, Ill.	Feb., 1917	F. FULTON, N. S.	June, 1916
E. DOUGHAM, Ohio	Feb., 1917	J. CHALMERS, S. Africa	June, 1916
J. W. HAUGHT, Ill.	Feb., 1917	G. R. HARRISON, Aus.	June, 1916
CHAS. F. GLENN, N. Mex.	Feb., 1917	J. WAYCICH, S. Africa	June, 1916
M. E. GOLLER, Pa.	Feb., 1917	W. VOIGHT, S. Africa	June, 1916
J. POTTHOFF, Neb.	Feb., 1917	MARTIN JENSEN, Wis.	June, 1916
G. M. GARREY, Mich.	Feb., 1917	CHESTER HUMBERT, Wis.	June, 1916
ERNEST FINLEY, Pa.	Feb., 1917	LINCOLN UNDERHILL, Cal.	June, 1916
A. TILLMAN, Cal.	Feb., 1917	M. BROTON, N. Dak.	June, 1916
WALKER BROS., N. Z.	Feb., 1917	HANS ERIKSEN, Ill.	June, 1916
G. W. WHITTINGTON, W. Va.	Feb., 1917	C. MORRELL, N. Brunswick	June, 1916
J. H. HOYLE, S. Africa	Feb., 1917	J. O. CONRAD, Kan.	June, 1916
IRVING BROS., N. Y.	Feb., 1917	ADAM SCHMITT, Mich.	June, 1916
F. ROSCHY, Pa.	Feb., 1917	J. G. REEVES, S. Aus.	May, 1916
AUGUST MILLER, Ill.	Feb., 1917	I. H. LUNDER, N. Dakota	May, 1916
C. P. ROBERTSON, S. Africa	Feb., 1917	JAMES SINCLAIR, W. Aus.	May, 1916
O. DANNEMAN, Minn.	Jan., 1917	H. BAKER, Aus.	May, 1916
S. HYTEM, S. Africa	Jan., 1917	E. O. KREIBEL, Kan.	May, 1916
G. A. GURLEY, Ore.	Jan., 1917	C. H. CAIRNS, N. Y.	May, 1916
F. K. WADE, Mo.	Jan., 1917	P. V. JOHNSON, Ohio	May, 1916
L. V. SENN, Neb.	Jan., 1917	C. E. SMITH, Vt.	May, 1916
S. H. AUSTIN, N. Y.	Jan., 1917	F. A. STEBBINS, Kan.	May, 1916
H. KAREL, Ia.	Jan., 1917	SANFORD BAKER, Mo.	May, 1916
J. H. BROWN, Kan.	Jan., 1917	E. B. ANDERBERG, Ill.	May, 1916
F. G. A. WILLIAMS, S. Aus.	Jan., 1917	WELSH BROS., Ind.	Apr., 1916
F. KUMMER, Ohio	Dec., 1916	KELLNER BROS., W. Aus.	Apr., 1916
ALBERT CASS, N. Z.	Dec., 1916	P. A. PETERSON, Ia.	Apr., 1916
H. GRIMM, Utah	Dec., 1916	G. F. BOWERS, Okla.	Apr., 1916
A. H. GOODING, S. Aus.	Dec., 1916	D. E. McDONALD, Fla.	Apr., 1916
LEONARD SMITH, N. J.	Dec., 1916	JAMES BAXTER, S. Africa	Apr., 1916
C. F. SHAW, Man.	Dec., 1916	E. P. DIGNAN, S. Aus.	Apr., 1916
W. ELWARD, Pa.	Dec., 1916	W. H. WINGET, Vt.	Apr., 1916
W. W. EGLY, Pa.	Dec., 1916	C. SCHMID, Neb.	Mar., 1916
JOS. BOYER, Mich.	Dec., 1916	J. SHARPLES, N. J.	Mar., 1916
J. WILLIAMS, N. S. Wales	Dec., 1916	A. ROCKENSCUP & SON, La.	Mar., 1916
J. H. W. SCHNEIDER, Cal.	Dec., 1916	C. H. ALEXANDER, N. Y.	Mar., 1916
W. SAUER, Minn.	Dec., 1916	A. M. HAREBO, Wis.	Mar., 1916
F. F. DARLING, Cal.	Dec., 1916	GEORGE HOWARD, Kan.	Mar., 1916
CHAS. NEWLAND, Cal.	Dec., 1916	G. N. FOLLMER, Neb.	Mar., 1916
J. T. BRAHM, Ia.	Dec., 1916	W. WILLOUGHBY, Mich.	Mar., 1916
P. H. ST. LOUIS, Wis.	Dec., 1916	H. HOFFMEYER, N. J.	Mar., 1916
A. E. NICKOLS, Okla.	Dec., 1916	FRANK L. LOCKE, N. Y.	Mar., 1916
C. J. HALL, Wash.	Dec., 1916	FRANK L. EVARTS, Conn.	Mar., 1916
BOB FRICKE, Ala.	Dec., 1916	C. R. WINGET, Vt.	Mar., 1916
JORRIS BROS., Tex.	Dec., 1916	H. & J. CHISHOLM, N. Z.	Mar., 1916
R. CLEMENS, Conn.	Dec., 1916	C. F. MCKENTEN, Aus.	Mar., 1916
SCHREFFLEY & SCHMITT, Pa.	Dec., 1916	H. D. PHILLIPS, S. Aus.	Mar., 1916
A. BRAUSE, Ohio	Dec., 1916	J. B. FRY, Wash.	Mar., 1916
J. E. BEATTY, Mo.	Dec., 1916	L. A. DOWNING, Cal.	Mar., 1916
GEO. CASBIE, Scotland	Dec., 1916	E. B. BUSICK, Ill.	Feb., 1916
JOHN KAIN, Ky.	Dec., 1916	F. MEHLIN, La.	Feb., 1916
F. W. HOWELL, Ill.	Dec., 1916	J. W. HEPPLEWHITE, Ohio	Feb., 1916
G. WHITTEN, Mass.	Nov., 1916	A. A. SCHREIBER, Tex.	Feb., 1916
J. M. VINCENZI, Wis.	Nov., 1916	J. T. DILLARD, Tex.	Feb., 1916
TOM NOLAN, S. Aus.	Nov., 1916	F. J. FLESSSEL, N. Y.	Feb., 1916
H. J. FRENCH, N. Z.	Nov., 1916	E. P. JONES, Kan.	Feb., 1916
F. N. BROWNING & SON, Ky.	Nov., 1916	E. J. BISHOP, N. Y.	Feb., 1916
J. MACUAC, Scotland	Nov., 1916	J. N. TYLER, Ohio	Feb., 1916
P. GEBSEN, Ill.	Nov., 1916	H. KREITZER, Pa.	Jan., 1916
J. W. GRIBBLE, S. Aus.	Nov., 1916	A. MOSHER & SON, N. Y.	Jan., 1916
W. G. SIM, N. Z.	Nov., 1916	F. FARLOW, Mass.	Jan., 1916
H. V. RUEHL, Ala.	Nov., 1916	C. M. HANUM, Conn.	Jan., 1916
G. LINDBORG, Ind.	Nov., 1916	PETER COX, W. Aus.	Jan., 1916
PITTMAN STELL, N. C.	Nov., 1916	CHAS. H. KERN, Ill.	Jan., 1916
R. S. FINKENBINDER, Ind.	Nov., 1916	J. H. ECHOYD, Cal.	Jan., 1916
T. D. WIXOM, N. Y.	Nov., 1916	THOMAS HORNE, Ariz.	Jan., 1916
C. W. SCHMIDT, Cal.	Oct., 1916	CHARLES TUCKER, Mich.	Jan., 1916
T. J. MAGUIRE, N. Y.	Oct., 1916	M. KLITGORD, N. Y.	Jan., 1916
A. W. WAITE, Cal.	Oct., 1916	O. STENNING, S. Dak.	Jan., 1916
C. W. ELLIS, Tex.	Oct., 1916	IVER JOHNSON ARMS AND	
J. P. SIMEON, N. S. Wales	Oct., 1916	CYCLE WORKS, Mass.	Jan., 1916
E. A. KNAPP, N. Z.	Oct., 1916	FELDMAYER & SCHAAKE,	
J. T. HASKINS, N. S. W.	Oct., 1916	Kan.	Jan., 1916
LOTHIAN & SKINNER, N.S.W.	Oct., 1916	T. ASHLAND, Mich.	Dec., 1915
W. B. KNOFF, Ala.	Oct., 1916	SCHUMACHER BROS., Iowa	Dec., 1915
GORHAM BROS., Ia.	Oct., 1916	W. P. MCWILLIAMS, Col.	Dec., 1915
W. H. F. BRAUCH, N. C.	Oct., 1916	C. PILNACEK, N. Y.	Dec., 1915
CLARK OLDS & CO., Neb.	Oct., 1916	J. E. MOORE, Cal.	Dec., 1915
IRWIN SCOTT, N. Y.	Oct., 1916	SAMUEL WRIGHT, N. Y.	Dec., 1915
C. E. DURHAM, Kan.	Oct., 1916	E. T. EVANS, N. Y.	Dec., 1915
M. RINGO, S. Africa	Oct., 1916	J. HOLBEN, Ohio	Dec., 1915
W. DELLEY, Queens, Aus.	Oct., 1916	L. E. SMITH, Kans.	Dec., 1915
G. E. HARPER, Texas	Sept., 1916	F. MARKGRAF, Minn.	Dec., 1915
J. J. ILLER, N. S. Wales	Sept., 1916	R. F. RANDALL, Mass.	Dec., 1915
JAMES POETTGEN & Co., Mo.	Sept., 1916	M. MACKIE, N. Y.	Dec., 1915
JNO. GOETZINGER, Ia.	Sept., 1916	CHAS. WINTER, Cal.	Dec., 1915
GEO. FLECKENSTEIN, Cal.	Sept., 1916	E. J. BUFE, Ia.	Dec., 1915
GEO. HILL, Aus.	Sept., 1916	GEO. SYKES, Aus.	Dec., 1915
E. C. BEARD, Aus.	Sept., 1916	W. PATRICK, N. Y.	Dec., 1915
J. K. GLINICKI, Mich.	Sept., 1916	JAS. A. SHARP, Mass.	Dec., 1915
OSCAR BURNER, Md.	Sept., 1916	J. KRAULEC, Ill.	Dec., 1915
A. J. HAMMOND, Cal.	Sept., 1916	P. E. DAHLFURST, Cal.	Dec., 1915
ROBERT MURRAY, Cal.	Sept., 1916	WM. BISHOP, Ohio	Dec., 1915
D. E. WRIGHT, Pa.	Sept., 1916	C. A. JERNER, Neb.	Dec., 1915
J. S. HASKELL, Col.	Sept., 1916	G. S. FISHER, Neb.	Dec., 1915
R. SOMMER, Aus.	Sept., 1916	PRINTERS SUPPLY COMPANY,	
J. A. SEQUIN, Can.	Aug., 1916	Neb.	Dec., 1915
JAMES CLARKE, Jr., Aus.	Aug., 1916	M. KENNEDY, Tasmania	Dec., 1915
DISPATCH FTY. LTD., N. Z.	Aug., 1916	WILLIAMS & TURNER, W. Va.	Dec., 1915
ERNEST E. DOTTY, Ohio	July, 1916	C. J. ASH, Kan.	Dec., 1915
F. C. ASHTON, Pa.	July, 1916	F. H. JOSLIN, Mass.	Dec., 1915
HENRY FISHER, Tas.	July, 1916	C. W. AMES, Mass.	Dec., 1915
J. W. FOWLER, N. Z.	July, 1916	C. L. SORSENSEN, Neb.	Dec., 1915
A. C. LODWIG, Cal.	July, 1916	E. WILLIAMS, N. Y.	Dec., 1915
A. A. BARLKE, Mich.	July, 1916	W. URQUHART, N. Z.	Dec., 1915
J. K. HANSEN, Aus.	July, 1916	W. RUPE, Kan.	Dec., 1915
J. B. BARKER, Ill.	July, 1916	L. S. KOCHER, Ia.	Dec., 1915
H. M. LARSEN, Wis.	July, 1916	P. W. FRASER, N. Z.	Dec., 1915
GEO. P. MACINTYRE, Me.	July, 1916	J. F. SHIMANEX, Md.	Dec., 1915
JAS. A. BUCHNER, Mich.	July, 1916	J. MACCLURE & SON, N. Z.	Dec., 1915



Ten Questions for the Month

The questions this month are on the subject of horseshoeing and anatomy of the foot and leg. If you find you cannot answer any one or more of these questions you may be sure that some study on your part is necessary. Not one of the questions asked is on anything that you as a horseshoer should not know. The answers to these questions will appear next month:

1. Why should the horseshoer study anatomy of the horse's foot?
2. Name the bones of the horse's foot and leg from knee to toe.
3. Describe the hoof.
4. What forms the hoof of the foot? What produces the horn of the hoof?
5. Name the parts into which the hoof is divided?
6. Is the thickness in the hoof wall always the same? If not, tell of differences.
7. What is the "white line" of the foot, and why is it important to the shoer?
8. What is the natural shape and texture of the frog?
9. What is the object or purpose of determining whether a horse's limbs and feet are regular (normal) or irregular in position, formation and action?
10. What advantages are gained by using a bar shoe?

Answers to Questions in December Issue

1. To get an intimate knowledge of the business, stock, and business requirements.
2. To expense.
3. To expense.
4. They represent money invested in the business;—the longer they are held the more profit they absorb, because the money tied up in them is not earning anything.
5. For the same reason that slow moving goods are unprofitable, stock held too long absorbs the profit likely to be made on it. Even an extra discount in the purchase prices should be no inducement to over-stock.
6. Percentage of profit should be figured on the selling price basis.
7. First: The amount of profit depends upon the volume of business,

and the volume of business is always figured on the selling price, not the cost price. Second: To get a profit the goods must be sold. Third: All allowances to customers for cash or otherwise are based on the selling price.

8. \$6.00 less \$5.00 leaves \$1.00. \$1.00 divided by \$6.00 gives us 16⅔%.

9. 100% represents the selling price, 20% represents the profit. 100% less 20%, or 80%, represents the percentage of the cost. If \$3.00 is 80%, 1% will be \$3.00 divided by 80, or 3¾c; and 100% will be 100 times 3¾c, or \$3.75.

10. 100% represents the selling price, 25% the profit, and 75% the cost price. If 100% equals \$5.00, 1% equals \$5.00 divided by 100 or 5c. 75% equals 75 times 5c, or \$3.75; which is the cost price.

How to Weld Flues

F. J. EMERLINE

We weld flues in an ordinary blacksmith fire, blown by an ordinary blower. The tools required are a light striking hammer, a mandrel long enough and of a diameter to fit easily in the tube and a couple of firebricks with which to support the tubes in the fire.

The tubes for welding are prepared as follows: Scarf one end of one tube with an inside scarf, by placing it over the horn of the anvil and hammering on the edge so as to bend it out. The end of the other tube is scarfed in just the reverse manner, i. e., its edge being bent in so as to fit inside of the other scarfed end.

When the ends are neatly scarfed, and well cleaned from dirt and scale, place the tubes in the fire, which should be clean, well coked and deep. When at a red heat, sprinkle borax on the scarfs and continue heating. Turn the tubes occasionally, so they will heat evenly, adding an occasional sprinkle of borax where needed. When the tubes are at a yellow heat, weld up right in the fire. The mandrel and firebrick will support the tubes so that plenty of pounding can be with the hammer. When welded and carefully hammered, so as to get as smooth a job as possible, take another heat and lay the tube aside to anneal and to relieve the strains. The

tube may then be smoothed up with the file.

If the work is carefully done, and the fire clean, this will result in a nice smooth job, and a solid tube, practically as good as new.

The Blacksmith Preacher Rev. Robert Collyer Dead

Rev. Robert Collyer died in New York City, November 30, 1912; and while he bore such titles as Doctor of Divinity and Doctor of Literature he will always be known as "The Blacksmith Preacher" to all members of the craft.

Robert Collyer was born in the little town of Keighley, in Yorkshire, England, on Dec. 8, 1823. His father was a blacksmith and it was only natural that the boy should turn to that trade to earn his living. Accordingly, in 1837, when Robert was 14 years old, he was apprenticed to a smith at Ilkley. We understand that the little shop in which Robert Collyer began to learn the trade is still standing in much the same condition as when he hammered on the anvil seventy-six years ago.

Here he worked at the anvil during the day, spending his nights lying by the forge, reading every book he could secure. His mother, who was a most lovable woman with a whimsical humor that gave pleasing color to the boy's personality, encouraged and aided him in his reading and studies.

One day a friend loaned the boy, now growing to manhood, a copy of Irving's "Sketch Book." After reading it his thoughts turned to America, but he was unable to realize his desire to come to this country until April, 1850. Just before sailing he married Miss Ann Armitage.

Two years before leaving England, Collyer drifted into a Methodist meetinghouse. He had suffered some sorrow, and found opportunity to lessen his burden by expressing his feelings. From that accidental start it became a custom for him to speak at irregular intervals. At times the town crier would announce on his rounds before church time, and between the clangings of his bell: "the blacksmith will preach this morning."



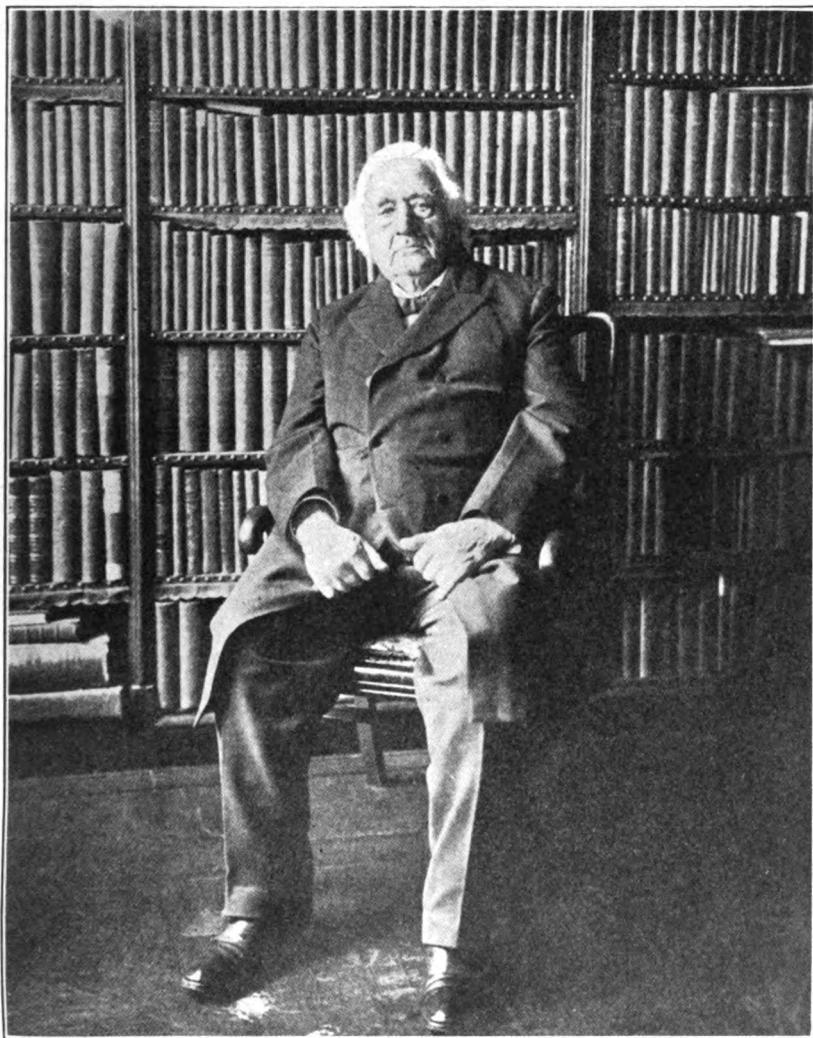
Upon crossing the ocean, Collyer found employment in Philadelphia where he worked at his trade for nine years, except during the panic of 1857 when he carried a hod and broke stone on the turnpike for a dollar a day. In the meantime he was preaching on Sundays at nothing a Sunday.

In 1859 the blacksmith preacher was asked to come to Chicago and

not pay him for the year to come—that he would take care of his family, even if he had to return to the anvil and make horseshoes. This statement attracted the attention of the trustees of Cornell University and they offered him \$1,000 for a horseshoe of his own making. He accordingly went to a shop, forged a shoe and sent it to the University where it is still a treasured souvenir.

observation, and while appreciating the value of the university he said that the great men in finance, politics, trade and art were those who studied in the school of experience rather than in the colleges of learning.

Dr. Collyer has lightened the burden of life for many, and while his titles indicated his high standing as a thinker, as a writer and as a scholar it is as the Doctor of Sorrowing Hearts that he appeared and appealed to the great mass of humanity. May the anvil and forge be the starting place of many, many more such men as Robert Collyer.



THE BLACKSMITH PREACHER—REV. ROBERT COLLYER

devote himself entirely to church work; and the first sermon he preached in that city was delivered in a little wooden building at Dearborn and Chicago streets.

During the Civil War, Dr. Collyer was temporarily relieved of his pastorate, to permit him to serve on the sanitary commission.

In 1869 a new church was dedicated which in the great fire of 1871 was destroyed. On the Sunday following the fire, Dr. Collyer held services among the ruins. In the course of his sermon he said his people must

The \$1,000 was the beginning of a fund that completed the present Unity Church building within the next two years.

In 1879, Dr. Collyer was called to New York to become Pastor of the Church of the Messiah. Upon reaching the three-score-and-ten he wished to resign, but he was made Pastor Emeritus.

Dr. Collyer occupied much of his time in recent years in writing and traveling. He always was strong physically as well as mentally. His knowledge was gained by study and

Some Leaks That are Common in the Average Smith-Shop

W. O. B.

In conversation with a group of smithing craftsmen, some time ago, the subject of leaks in the shop was discussed. One smith stated that he did not know anything about other shops, but he said he knew there were no leaks in his shop. A short time later the writer happened into that man's shop and pointed out the following three leaks which were apparent at the time of the writer's visit:

One of the men was at work at the drill. Instead of putting the oil on the bit where it would do the most good, an all too liberal quantity was squirted—or at least an attempt made to squirt it—into the hole. The oil ran all over the work and some even dropped to the floor.

"Leak number one," pointed out the writer. "Oh, but oil is cheap" returned the smith-shop owner. "Perhaps so," said the writer, "but you don't get it free, do you? Your man uses it freely, but I believe you exchange a piece of good money for every pint of it."

The writer then stopped to watch one of the men at work at the forge. The man happened to be making tee-plate fittings for a large wagon box. A simple job of cutting and welding flat band stock—with no need, necessity or excuse for waste—yet the man had to cut from one to three inches from three of the four pieces he made.

Here was leak number two. Leak number three was discovered as the



writer was bidding the shop owner good-bye. An automobile had been stopped before the shop to replenish the supply of gasoline. In order to draw the necessary quantity, the smith's man had to remove the vent cap from the top of the tank which was located in a small shed at the side of the shop. After the oil had been paid for by the automobilist, the shop owner's helper returned the can to its place beside the gasoline tank, but he did not replace the vent cap. This seems to be a small matter, until one understands how very quickly gasoline evaporates.

This little experience prompted the writer to make a quiet little visit to a few other shops, and these are some of the leaks discovered:

A woodworker was observed using a plane, which, when he finished using, he laid knife-side down on a file that happened to be lying on his bench.

We didn't stop to ask why he didn't get the habit of laying a plane on its side.

Another man was attempting to rush a piece of work, which he was drilling, by forcing the bit through it. He didn't seem to realize that the minute



FIG. 1—YOU MUST USE YOUR OWN BRAIN

saved in that one job would result in from twenty to fifty minutes' loss in future jobs, because of the resulting dullness of the bit.

Beside another shop we observed a bonfire of no small proportions, where the smith had evidently just been heating tires. The tires we found were fitted to their wheels, and while there was considerable good wood in the fire it was allowed to burn itself out. A pail of water would have saved enough of the wood to start another set of tires



FIG. 3—THE SUCCESSFUL ORNAMENTAL WORKER MUST USE HEAD AND HANDS

well along toward the setting point.

At another shop we saw a smith take a piece of steel from the stock



FIG. 2—THINK OUT THE IDEA THEN WORK IT

rack, take it to the forge, cut off the length he required and then return with it to the rack—and drop it on the floor beside the rack. When asked why he did that, the smith replied in one word: "Habit."

In this same shop we saw another man flooding both drill bit and work with oil. Another worker did the same in cutting threads on some short lengths of pipe.

In another shop we watched a smith turn and fit shoes. On every one he used about twice as much compound as necessary in welding on the toe calks; and the floor man dropped three nails to the floor, which were not picked up, before he drove the first nail to hold the first shoe. How many more he wasted we do not know, as our attention was diverted by a sound issuing from the rear of the shop. Upon investigation we found one of the men putting



his tools away for the day by throwing files, hammers, pliers, screwdrivers and nobody knows what into a drawer.

Perhaps, some day, we will again have enough courage to make another leak-hunting tour.

Ornamental Wrought-Iron Design

THOMAS F. GOOGERTY

If one is to be successful in designing and making ornamental iron work or any work of this character he must learn to use his head in conjunction with his hands; that is to say he must think out his own ideas and not be depending on someone else to furnish every little detail. One who continually depends on the other fellow for those things will never advance very far. He must use his own brain in trying to figure out easier and better methods to handle his work, and should also use his head in trying to invent ornaments suitable to be worked out in iron, and not be dependent on some other person's designs. Even though he does not understand the principles of design very well he should be continually working out new ideas; as by this method alone can one evolve, become strong and stand on his own feet independent of others. This is also true of the professional decorative designer; when he fails to use to the fullest extent his inventive powers his work will not improve, but on the contrary it will deteriorate.

If one understands the principle of design he can work out his conceptions with far more assurance that his work will at least be built on right lines, even though it is not the best. Any man works better and understands what he is doing with more

certainty after study and research; as he will then have a good idea what has been done before, both good and bad; also what difficulties to avoid which arise from conditions of today. Therefore, one who likes the artistic side of iron, and wants information on the subject, should study some good books on design.

Perhaps from the 12th to the 17th century the best ironwork was made; as some of the finest examples were produced during that time. Its forms and uses seemed to be better understood and generally more worked than later. A study of the



FIG. 5—WITHOUT ORIGINAL IDEAS THE WORK CANNOT IMPROVE

older forms, especially those of Mediaeval German, shows that they fashioned their iron more in keeping with its properties, and that they were imbued with the spirit of art in their work by a close following of conventional treatment of ornament.

Iron is a crude metal and should be found in its proper place, serving the purpose for which it was made, and not designed so as to be fashioned into shapes which are more suitable to be wrought from the precious metals. In designing, nature does not furnish us with readymade designs. Any attempt to reproduce natural forms in iron is a mistaken effort on the part of the designer.

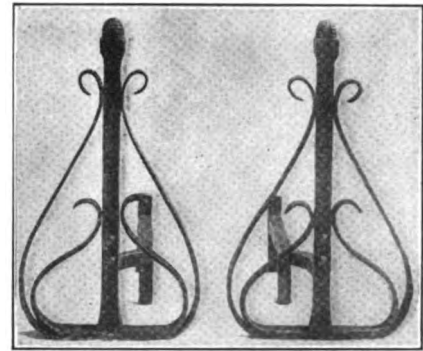


FIG. 6—THE COST OF COPYING THE DESIGNS OF OTHERS IS DETERIORATION

It is impossible to utilize things in nature in design without the play of human invention and imagination.

Realistic iron roses, lilies and other flowers are inconsistent with the material in which they are executed. They kill the strength and destroy the character of the metal. This should be learned by the workman, and if he will devote just a little time to study and research he will learn some of the virtues and characteristics of this metal.

When the ironworker of the past tried to imitate nature too closely in leaf and flower he failed as a designer and his work deteriorated. One proof of this fact may be found in what has always been acknowledged to be the better examples of ancient and modern work; for in them we find no deviation from the path of conventional ornament.

It does not matter what motive one uses in iron designs, the only question to be considered is, has the design order regarding its lines and masses? Familiar types of flowers have nothing at all to do with the design being good or poor. In any good design we find them only in a conventionalized form. We may make our designs by an arrangement of ideas based on things in nature or they may be purely abstract ones. However, we must use our inventive powers and arrange our ideas to get rhythm, balance and harmony in our designs.

Fig. 1 shows a grill design, based on the growth of a flower. The main stock or stem is running up through the center and dividing the rectangle of grill into two equal measures; terminating at the top with a shape derived from the flower. The spirals derived from leaf form spring from the sides of stem, emphasizing the

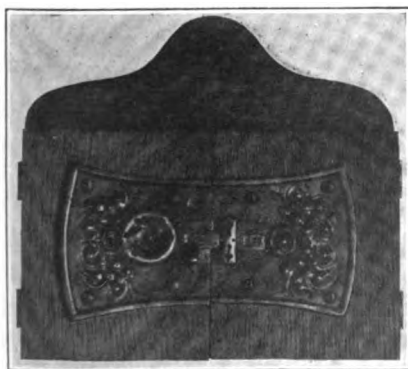


FIG. 4—THE PRINCIPLES OF DESIGN SHOULD BE UNDERSTOOD



FIG. 7—INVENT AND ORIGINATE
YOUR OWN DESIGNS

growth of leaf, and forming graceful curves which are distributed equally over the whole rectangle; giving the design order in its arrangement.

In making the grill a full sized drawing is made of the surface plate; each member is then measured with a cord and the stock cut. The entire grill is welded together and then formed into shape.

Fig. 2 shows an electric lantern with art glass; it is to be used in the vestibule of a residence. It may be suspended from the ceiling by a chain or hung on a side wall bracket. The sides of lamp are 7 in. by 5¼ in., and the entire lantern is made from No. 20 soft steel. The idea for decoration in the sides of lamp is derived from the flower bud, and so arranged as to give a decorative effect to the lamp.

Fig. 3 shows a number of drawer pulls, hinges, conventionalized leaves, flowers and other ornamental forgings. Figs. 4, 5, 6 and 7 show a latch for a double door, a knocker for a door, a set of andirons and a copper ink well.

Interior ironwork should not be painted or electroplated. It should be allowed to be seen and recognized as just iron. A good finish to use on this kind of work is to heat the metal a little and rub on linseed oil with a cloth. The surplus oil is then rubbed off. This kind of a finish does not destroy the texture of the metal and will prevent it from rusting.

The illustrations shown are from work executed by boys and their instructor in the Illinois State Reformatory forge shop.

Scientific Management

In a nutshell, scientific management means simply knowing—knowing

—knowing. To explain more fully—knowing all the time just what everything you do produces—just what each and every effort is bringing, in the way of results.

It isn't enough these days to merely "guess" that this, that or the other thing pays. It isn't enough to "guess I come out even on that," or to "guess the shoeing shop pays." You must KNOW, not guess. You must know whether a certain department or line of work is paying. You must know how much it is paying or losing. You must know whether or not your time could be more profitably spent if devoted to some other line or department.

Thousands of craftsmen fail to make the success they should, just because they think this, that or the other thing needs attention most, when in fact something else will pay twice, thrice or twenty times as well.

And unless you know where your efforts are most effective you cannot know which things pay best—which things to do—you cannot make the success you should.



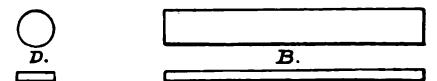
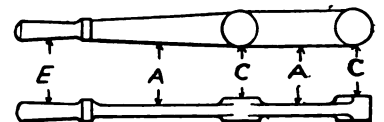
System and Regulation for the Blacksmith Shop

JAMES CRAN

At the present time, system in a great many cases and places has become a fetish to which some of the most potent elements in modern manufacturing are sacrificed. In short, its cost of maintenance is out of all proportion to the benefit derived from it. The reason for this seems to be that system, like speed

in the 20th Century, has become a craze and has to be kept up for the sake of fashion, regardless of economy or convenience. System, however, is just as essential in economic and successful production as material, machinery and labor. But the principal ingredients of all systems should be common sense and economy, so arranged that time, material and labor will be saved. Otherwise, it is sure to be a failure. Another thing that ought to be remembered is that system cannot be standardized. What may fill the bill for one concern might be a heavy handicap to another, even if their line of products were the same. No two manufacturing plants, even if their lines of product are similar, are arranged the same, any more than their equipment is likely to be the same. Therefore, before any system that will serve the purpose for which it is intended is put in force, conditions in general and the location of the various pieces of equipment should be carefully studied and the system adapted to the conditions and not the conditions to the system. Another thing generally overlooked or completely lost sight of is the fact that no matter how simple and efficient the system adopted may be or how well it may serve its purpose it cannot at all times be followed to the letter, but should at all times be strictly adhered to in principle.

† If there is one branch of manufacturing more than another that could be improved by a little common-sense system it is the average blacksmith shop where, as a rule, system is either conspicuous by its absence or so much neglected that it does not mean anything to the workman. For this state of affairs in blacksmith shops there is a reason. Generally,



THIS WILL SHOW THE WRONG
KIND OF SYSTEM

someone who is very unfamiliar with blacksmithing or the difficulties to be contended with is responsible for a system which could not be worked up to, however willing the workman are



to do their part. As an example the following which actually happened, is pertinent:

In a certain manufacturing plant where the product was of the highest grade, but their system rather lax, a change in the management was made. The new manager, very energetic and affected with the system microbe, engaged the services of a professional systematizer who was to have everything working like clock-work in a short time. It would only take a minute or two at any time to tell just how far advanced any part of their work was or the exact cost. Of course, the blacksmith shop received its share of attention, and as a result was completely demoralized. Amongst the forgings made in that particular shop were a number of levers of the style shown in the engraving. These were forged solid from machinery steel, but that method, in the systematizer's mind, was far too slow and expensive. He had the pieces for the bodies of the levers A, A, cut with a power saw from a flat bar as shown at B. Four discs for the hubs C, C, were cut from the end of a round bar as shown at D, and the handle, E, was made on a turret lathe and supplied to the smith all ready to be welded on. The systematizer reasoned that a blacksmith could weld, and by having pieces of the exact size and shape cut and sent to him only three heats would be required to do the whole job. One to weld on the two discs for the center hub, one to weld on the two discs for the end hub and one to weld on the handle.

It is useless for the writer to explain here the utter ridiculousness of the systematizer's idea, as any blacksmith will see at a glance how impractical such a method of forging a lever is. However, this will show the wrong kind of system for the blacksmith. Therefore, it is a wise move on the part of the systematizer, whether he be someone engaged specially for that work or some individual of the permanent management, to familiarize himself with conditions and confer with the man in charge before jumping at conclusions which may result disastrously.

To begin with, any blacksmith shop where system can be carried out to advantage ought to be large enough to have a place for everything; otherwise there is sure to be more or less

confusion. Forges, furnaces, power hammers, all other machinery and heavy pieces of equipment (if there is more than one of each) should be designated by numbers large enough and of a color that can be seen from any part of the shop. This saves confusion and obviates the danger of mistakes being made when giving men instructions. With each forge there ought to be a tool bench or rack of suitable capacity to accommodate one complete set of blacksmith's tools, and it should be marked with a number corresponding to that of the forge to which it belongs. These

by eighths; three or four hot chisels; one cold chisel and an assortment of gouges, punches, drifts, etc., to suit the average line of work. Larger and smaller sizes of tools than those here mentioned may be classed as special; of which more later. Of course there is nothing definite about the list of tools here given. It should be varied to suit conditions, but each tool composing a set should be marked with its size and the number of the forge and rack to which it belongs, so that if they should at any time be borrowed and get mixed with another set they can at once be identified and



YOUR SON? GIVE HIM A MAN'S JOB!

With Apologies to Power

racks are much improved when provided with a drawer for the accommodation of the blacksmith's private tools, such as dividers, calipers, etc., as well as for the prints from which he may be working, or other paper matter. With each tool rack there ought to be one complete set of blacksmith's hand tools suitable for the class of work done at that particular forge. The average set of blacksmith's tools for machine forging usually consists of two flatters, one with the edges slightly rounded and one with the edges well rounded; fullers, top and bottom from $\frac{1}{4}$ inch up to 1 inch, advancing by eighths; swages, top and bottom from $\frac{1}{4}$ inch up to 2 inches, advancing

returned to the place where they belong.

Each tool of a set should have its own place in the tool rack and should be placed there as soon as the operation for which it was used is completed. Fullers and swages should be placed in consecutive arrangement according to their sizes, and other tools where they will be most convenient to reach. This enables the blacksmith to at once put his hand on any tool he may want, without having to waste time going over the whole lot before it is found. Each blacksmith when he commences work in a systematized shop should be supplied with a list of the tools he is provided with and be held responsible



for them. As well as the tools mentioned, each forge should have others to be used in keeping the fire in shape; a small shovel, a poker, a fire rake, a large shovel for coal, and an assortment of tongs, suitable for the line of work, all marked with the same number as the forge.

The same plan should be followed with steam hammers and other machines, and the tools and fixtures belonging to them.

Any swages or fullers, larger or smaller than those composing the regular sets at the forges, all tools made specially for some particular forgings, wrenches, taps and dies, tongs for special forgings, in short, all tools for general use around the blacksmith shop ought to be kept in a tool crib and given out to the workmen on checks the same as is generally done with tools in machine shops. By doing this, special tools and tools for general use are not so liable to get mislaid or lost as they are when stacked up any old place around the shop, as seems to be the general rule.

(Concluded next month)



The Care, Repair and Operation of the Automobile*

(With Special Reference to Overland Cars)

Care and Adjustments

Half of the ability to make an adjustment or repair is the ability to discover its necessity.

Never tinker with the different parts of a car nor labor with the starting crank without first bringing

(*Copyright, The Willys-Overland Co.)

some little intelligent consideration to bear upon the question of what is most likely to cause the difficulty.

It is of little use to turn the engine over and over by the starting handle or by means of the engine-starter in an effort to set it going. If the engine will not start with a few turns, the chances are that there is something radically out of order, requiring intelligent attention. With the carburetor giving a correct mixture, the ignition system affording a hot and effective spark, and everything else apparently all right, it should be as easy to secure an explosion on the second stroke as on the sixtieth. So if the engine will not start with the second or third attempt it is not likely to start with three or four hundred attempts; consequently it is better to find out the trouble than to turn the motor over indefinitely.

Washing, Cleaning and Polishing

It would raise the hair on the head of a coachman accustomed to the care of highly polished body surfaces to see a chauffeur attack the body of an automobile with hot water, soap and a scrubbing brush. Yet this is done every day. Some automobile bodies go through no fewer than twenty-two operations in the paint shop. Intelligent care will preserve that finish a long time, while carelessness in washing and cleaning may shorten its lasting qualities materially.

The rubber hose commonly used in garages is perhaps the best method of cleaning the lower portions of the car, such as wheels, axles, frame and mudguards, but it is positively injurious when used on the body and finished surfaces. The force with which the stream of water strikes the varnish causes the sand and grit adhering to the body to be driven into the polished surface, destroying its brilliancy; and no amount of polishing and rubbing will restore the former luster.

For washing, use cold or tepid water, and if you prefer the hose, let the water flow without much force. Do not direct the stream of water too strongly against the wheel bearings, since moisture is apt to enter them, causing them to rust. Where no hose is available an ordinary garden sprinkling can is just the thing. Soften the dirt and wash it off completely with one or two more sprinklings; then dry the surface with a soft sponge.

Still better, have two sponges, one for the running gear which usually gathers considerable oil, grease and dirt, and one for the body, hood, top of mudguards, etc.

Take care to soak the water out of all recesses where it might cause rust. When thoroughly dry, polish with a piece of chamois.

Many use a mixture of cylinder oil and kerosene, which they apply

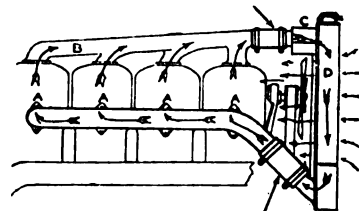


FIG. 1—THE BEST WATER TO USE IS RAINWATER

to the body, rubbing it dry immediately afterwards.

When it is necessary to clear the radiator spaces of accumulated mud, flush the radiator from the rear, not from the front. In that way you avoid getting water into the magneto, which is often short-circuited when moisture enters it.

A much recommended body polish is made by mixing the following ingredients:

Turpentine.....	1	gallon
Paraffine Oil.....	1	pint
Oil of Citronella....	3½	ounces
Oil of Cedar.....	1½	ounce

Another scheme is to use a mixture of boiled linseed oil and turpentine, applying it sparingly and rubbing absolutely dry. The use of these polishes will restore even an old car to a degree of brightness that will please the owner.

Mohair tops should be frequently dusted and brushed off. Pantasote tops and curtains are best cleaned with a soft brush dipped in water to which a little ammonia has been added. Afterwards rub dry. Never attempt to clean top and curtains with gasoline or kerosene.

Do not fold the top until it has become thoroughly dry, because any moisture remaining in the folds is apt to cause mildew, besides making the top leaky and unsightly with spots.

When a car is not used for some time, it is best to open the top, which is thus kept well stretched and smooth.

Do not use gasoline in cleaning leather upholstery. Plain water with a little ammonia will remove the



dirt, and a brisk rubbing with a clean woolen or flannel cloth will do the rest. For still more careful treatment use a regular leather dressing.

Any good brass polish will work satisfactorily on the metal trimmings. All these preparations contain some fine abrasive, for which reason care must be taken not to let the polish come into contact with the varnished body surface. Nickered trimmings should be rubbed over with an oily rag; that will keep them bright without polishing.

There is little occasion for cleaning the burners of the acetylene

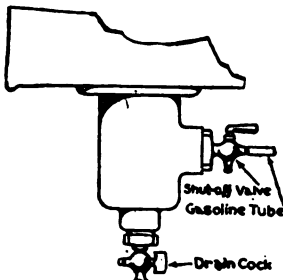


FIG. 2—UNDER THE GASOLINE TANK

lights if the flame is never permitted to become so low that it nearly peters out. Acetylene gas burns sooty when the flame is turned

very low. It is better to get a new burner than to attempt to clean one that is clogged up. The gas passages are very small and the material of the burner is easily chipped.

Cooling System

The cooling system of the Overland is the so-called thermo-syphon or natural cooling system. The action of this cooling system is, briefly, as follows:

The water enters the cylinder jackets at A, Fig. 1. Upon becoming heated by the explosions going on within the engine the water rises to the top, entering the pipe B and passing into the radiator at C where it is brought into contact with a large cooling surface D, in the shape of the cellular radiator. On being cooled and thereby becoming heavier the water sinks again to the bottom of the cooling system, to enter the cylinders once more and to repeat its circulation. The cooling action is further increased by a belt-driven fan which draws air through the radiator spaces.

In localities where pure water is not easily obtained it is well to strain the water through muslin. Soft water is better than hard water, because the latter is apt to deposit a scale on the walls of the radiator.

The best water to use is rainwater.

When it becomes necessary to clean the radiator, a good way is to dissolve a half pound of lye in about five gallons of water. Strain the liquid through a cloth and put in the radiator. Run the motor for five minutes, then draw off the cleaning mixture. Fill with clean water and run the motor again; remove the liquid once more and finally refill the cleaned cooling system. Avoid the use of more powerful chemicals.

Open the draincock under the radiator about once a week and let all water and accumulated dirt, etc., run out. An effective way to do this is to keep on filling the radiator while the water continues to run out below; when the water begins to look clear, close draincock and filler cap.

About once a season, particularly after the car has been driven during the winter, it may be necessary to renew the rubber connections of the cooling system; these connections are indicated by arrows in Fig. 1.

Gasoline System

Under the gasoline tank there is a sediment cup or separator, Fig. 2, which serves the purpose of collecting foreign matter that may be carried along in the gasoline.

The sediment cup is provided with two outlets; the horizontal one leads to the carburetor and the vertical one serves as a draincock through which accumulated water and dirt may be drawn off occasionally; it is also useful when gasoline is needed for cleaning spark plugs, priming the motor in cold weather, etc.

It is not always possible to keep gasoline entirely free from water, which enters it usually by moisture condensing on the walls of receptacles, and you should therefore make it a rule to strain all gasoline through a funnel lined with chamois skin. The chamois has the peculiar faculty of keeping back water while allowing gasoline to pass through.

When filling the gas tank, extinguish the lights of your car and

those of cars close by, because gasoline vapor travels.

In trying to trace a gasoline leak, don't light a match or place an open light or lantern under the car. Gasoline vapor is heavier than air and accumulates near the ground.

It is not a bad suggestion to carry lengths of rubber tubing of the kind used on the gas lamps. By connecting this tubing with the gaspipe and setting one lamp on the ground it is possible to illuminate the underpinnings of the car. Of course the light should be kept the proper distance away from the car. A small electric pocket-lamp is an excellent thing, for while its light may not be of great brilliancy or long duration it is safe to use in positions where the presence of any other light might cause trouble as, for instance, in the vicinity of a leaky gasoline tube.

From the sediment cup the gasoline line leads to the carburetor which converts the liquid fuel into vapor, mixes the vapor with the correct proportion of air and delivers this combination through the intake manifold in proper rotation to the engine cylinders, Fig. 3.

The carburetor is the very heart of the motor and on its proper adjustment depends the satisfactory working of the engine.

It is a fact well known to experienced motorists that atmospheric conditions have much to do with

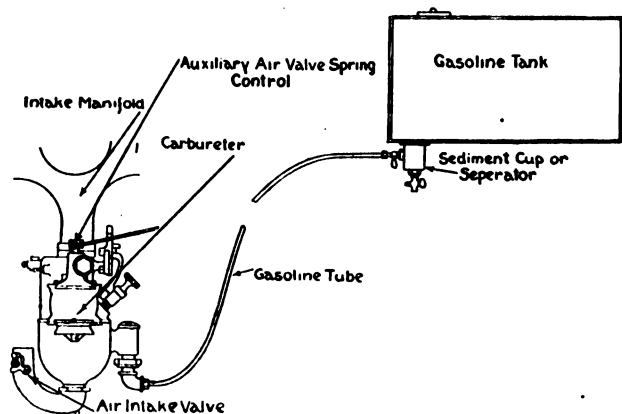


FIG. 3—DON'T HUNT A GASOLINE LEAK WITH A LIGHTED MATCH—YOU MAY FIND IT

the action of the carburetor. It is often observed that a motor seems to develop more power at night than during the day, a circumstance which is due to the presence of moisture in the cooler night air.

Likewise, taking a motor from sea level to an altitude of 10,000 feet



involves using air in the engine cylinders at atmospheric pressures ranging from 14.7 lbs. down to 10.1 lbs. to the square inch. All carburetors will require some adjustment in the course of any material change from one level to another.

Great changes in altitude also have a marked effect on the cooling system of the car. Water boils at 212° Fahrenheit only at sea level.

come up in our trade which we think would be an interesting one for you to take up and discuss in one of your articles.

A certain class of manufacturers sell a part of their product below cost, and rely upon the other part, which is sold in connection with it, to carry it. It has been subject to a good deal of discussion among the trade, whether it would be a good policy to take a united stand and increase the product upon which they are now losing money to a price that will put it on a profitable basis. A question has come up as to whether this would come under any law in restraint of trade. Would

and provides that any person engaging in such a thing shall be fined not exceeding \$5,000 or imprisoned not exceeding one year. This is Section 1, which covers combinations in restraint of trade. Section 2, which is usually cited in connection with Section 1, forbids monopolies, which this question does not involve.

Before the United States Supreme Court handed down the decision in the Standard Oil case, in May, 1911, a combination such as this correspondent described would have been a clear violation of law. The law as it stood then is expressed in a leading case as follows:—

Upon this review of the law and the authorities we can have no doubt that the association of the defendants, however reasonable the prices they fixed, however great the competition they had to encounter, and however great the necessity of curbing themselves by joint agreement from committing financial suicide by ill-advised competition, was void at common law, because in restraint of trade and tending to monopoly.

This meant that there could be no combination of any character among sellers, whose object was to fix or maintain a price, even though the price sought to be fixed or maintained merely allowed a living profit.

Therefore, if this question had been asked me prior to May, 1911, I should have said without qualification that the plan was illegal.

Today it is not so sure to be. It may or may not be, for in the Standard Oil case the court said that the law only meant to forbid combinations that restrained trade or competition *unreasonably*. Without doubt a combination among manufacturers which seeks only to raise a price from a point below cost, where reckless competition has forced it, to a point only so far above cost as to pay producers a fair living profit, is not an unreasonable restraint of trade. So that in my judgment such a plan might be legal, provided—and this is very important—the case of the manufacturers who tried it was clean and clear in certain other respects, which I will explain.

According to this correspondent, the manufacturers he speaks of have all sold some one thing below cost, and have recouped themselves by taxing an extra profit upon something else. I suppose this is common to almost all lines of trade. The grocer, for example, will charge 50 per cent profit on tea, and sell sugar and sometimes flour at cost or below. But

A PRIZE CONTEST

From time to time we receive very clever letters from our friends and subscribers—letters full of original thought—some humorous, some grave, all good, pleasant reading. To encourage clean, clever, original letters of this kind we offer prizes as follows:

FIRST PRIZE - - \$50.00 IN GOLD

SECOND PRIZE - A GOLD WATCH

THIRD PRIZE - - A FOUNTAIN PEN

for the cleverest letter accompanying a subscription remittance of one dollar or more and received during 1913.

The letters may be humorous or grave; they may contain kicks or bouquets; they may be written in rhyme or prose—but they must be clean, clever and original, and accompanying a subscription remittance of one dollar or more.

As an example of the kind of letters we want, the following received from Mr. Tom Roop of Ohio is an exceedingly clever one:

Dear Editor Bernhardt:—

Please find enclosed an unfolded sample sheet of Uncle Sam's paper of recent issue upon which you will observe certain figures and pictures, solid valuable reading matter and no fiction. No claim is herein made that this enclosure in weight or intrinsic value equals your yearly enclosure to me, but it is customary for an orthodox subscriber when he has a \$ about his person for which he can find no present or future use to shy it at the Editor's plethoric purse through the mail or by some other artful agency, and against his vicious practice the hapless Editor seems to have no adequate means of self-defense.

Your sympathetic friend,

TOM ROOP

P. S. I will surprise myself and take out two years', Christmas.

Get your "funny bone," your "bump of cleverness" and your "dome of originality" to working—make a grab for those fifty round little pieces of Uncle Samuel's favorite product. Get busy now whether your subscription expires now or later—but get busy, then you'll have your letter ready. Remember—cleverness and originality are the deciding points. The judges will be announced later. The contest closes, December 31, 1913.

At an altitude of 10,000 feet it will boil at 193° Fahrenheit.

A Query Answered As To Price-Fixing

ELTON J. BUCKLEY

This query, which touches a subject certainly timely and important, comes to me from New York:

Apropos of your legal articles which are running in our magazine, a question has

this be so, or does this law apply only where the obvious intent is to restrict and control prices?

If such a plan is illegal at all, it is illegal under the Federal law, which is usually known as the Sherman Act, and which is intended to prohibit combinations in restraint of trade and monopolies. It prohibits "every contract, combination in the form of trust or otherwise, or conspiracy in restraint of trade or commerce,"



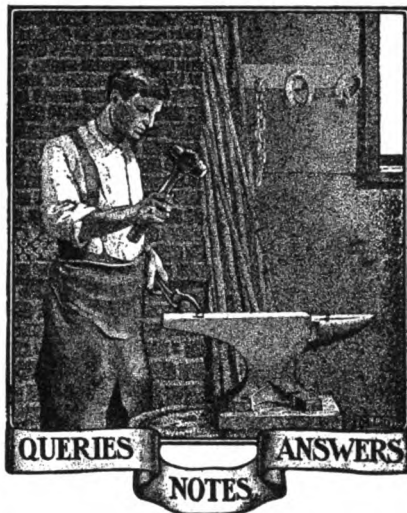
the point is this: Will the manufacturers in question, after they have their below-cost price raised to a profitable basis, lower the price of the items which have been carrying a double burden? In other words, is their idea to regulate and make uniform the prices of their different products—put its share of the burden on the article that hasn't been bearing it, and take the excess off the others—or is it merely to get an extra profit by raising the cheap items and at the same time keeping the prices of the others where they were?

All these questions would be probed to the bottom, if a price-fixing plan came into question, and I am very clear that the manufacturers involved would fare poorly unless they had shown good faith by evening up unduly high prices when the unduly low prices had been raised.

Another consideration the courts would undoubtedly inquire into is whether the concerted advance in price would have the effect of keeping in business an excessive number of traders. It is easy to see how it could have that effect. For instance, there are too many manufacturers selling a given standard thing. They are together producing more than the demand will take, and their frantic efforts to market their products have forced prices below cost. Nobody is making any money and the competitors finally combine to raise and keep the price where they will all make a fair profit. No court in the world would permit them to do this under these circumstances, for the cause of the unduly low price in the first place was too many sellers. Not for a minute would the court protect such a condition. It would leave the parties to fight among themselves until the weaker had succumbed, and until the excessive number of traders had been reduced to a proper number. Then, if these, for any good and sufficient reason, later fell into the slough of despond, and again found themselves selling below cost, I believe they could go into court with a very good chance of having the court uphold such a plan as is above described. They might as well understand clearly, however, that the attitude of the court toward such a situation would not be friendly, and they would need to present a clear, strong case to be upheld.

The principles of law and logic which govern the conduct of manufacturers who seek to control prices would also govern the conduct of wholesalers or retailers who seek to do it.

(Copyright by Elton J. Buckley)



A Power Hammer Query.—I am an old smith and have worked in Missouri for twenty years. I have run a shop carrying hardware and implements. I have been here in Oklahoma four and a half years and have the best shop in town. I will put in a power hammer soon, so please tell me in "Our Journal" which is the best hammer and the size for a hammer for plow work. Most of our work is on plows.

W. O. DOUGLASS, Oklahoma.

A Blower Question.—There is one thing which I have been studying on quite a while and would like to ask about it through the Journal. I would like to know how I can make my 20-inch blower blow the fire and draw the gas and smoke away at the same time. If it can be done successfully. My chimney draws good, but I would like to have it draw better. I would quit the trade if I could not have power to work with.

S. W. WALLACE, New York.

Why Do the Tires Crumble?—I am very much interested in the cold tire subject in "Our Journal." The majority believe in them. We have one and it works all right; but what is the cause of this? If you have a tire set on a cold tire setter, when the tire gets loose perhaps you have to take it to a place where there is no cold tire setter, and you are obliged to have it done in the old way. As soon as the smith strikes the weld, the tire breaks up like cast iron; what is the cause of that? T. A. PHILLIPS, South Africa.

Emery Buffers and Two-Cycle Engines.—I would like some information on the dressing of emery buffers. I have had no trouble until a few months ago, when it seemed that I could not get the emery to stick to the wheel. It would fly off as soon as the wheel was started. I have tried every way I know of to make it stick, even to drying in an oven before using. I would consider it a favor if someone would tell me through the columns of your valuable paper what to do for my wheels.

I would also like to hear from some brother who has had experience with a two-cycle gas engine in the shop. Are they

satisfactory,—do they deliver the proper power, are they any more trouble than the other kind?

ELMER E. ROBERTS, Indiana.

A Waterproof Glue.—We have use for a glue that is waterproof. Can you or some brother reader give us a good reliable recipe? M. J. MARTIN, Indiana.

In Reply:—A very superior article may be made by dissolving 3 parts of India rubber in 30 parts of naphtha. Heat and agitation will be required to effect the solution. When the rubber is completely dissolved, add 64 parts of finely-powdered shellac, which must also be heated in the above mixture until all is dissolved. This mixture may be produced in sheets like glue by pouring it while hot upon plates of metal, where it will harden. When required for use it may simply be heated in a pot till soft. Two pieces of wood or leather joined with this glue can scarcely be sundered without a fracture of the parts. G. M. M., Ohio.

A Saw Question.—I would like to ask through the pages of "Our Journal" how to gum cross-cut saws and small circle saws about twelve inches in diameter. Give the kind of emery wheel, the size and different steps in doing the work.

F. R. SEFCIK, Kansas.

In Reply:—To explain and to give your reader all the information he wants and should have on the subject of saw-gumming would require considerable time and space. There are a number of good books on the subject which your querist can secure at small outlay. Perhaps you can suggest a recently published book with which you can supply him.

JOHN A. WILLIAMS, Ohio.

"Saw Filing and Management of Saws," by Robert Grimshaw, is a good book on the subject. The new edition recently published contains 130 pages, many illustrations, and will be sent postpaid for \$1.00.

BOOK DEPARTMENT.

Wants to Know How to Braze.—Kindly give directions for brazing with a gasoline torch, so as to braze iron. What flux is used, how it is applied and just how the work is done.

E. D. FYKE, Texas.

In Reply:—Brazing may be briefly explained as follows: The surfaces to be joined are thoroughly cleaned where they are to come in contact and are then held in position by wire or clamps. The joint is then heated, borax applied and a prepared brass called "spelter" sprinkled over the joint. The heating is continued until the spelter melts and flows into the joint, making a union between the pieces. Common brass wire, brass filings and small strips of brass may be used instead of the prepared spelter. Brass wire will be found very convenient in most cases, as it can be bent to the shape of the joint and held in place very easily. The main points to bear in mind when brazing are cleanliness and a good clean fire. The parts to be joined must be absolutely clean and free from all dirt, grease, paint or other foreign matter.

H. M. J., New York.

To Harden Shares and Shovels.—I would appreciate some information on the subject of hardening shares and shovels. Can some brother who has had experience in these lines tell me about this work?

F. B. BARNES, Ohio.

In Reply:—First, it is necessary to use soft center shares and shovels. For plow shares take a piece of 1½ by ½-inch wagon



tire and bolt on back of share. Then heat to cherry red and sprinkle while in the fire with pulverized cyanide of potassium on face of share, being careful not to inhale any fumes, as cyanide is poison. Then plunge in slack tub edge first. The tire iron on back of share prevents share from warping. Leave in the tub until cool, then polish.

For cultivator shovels: Heat to cherry red and sprinkle with cyanide of potassium all over face, then cool slightly each cutting edge of shovel $\frac{3}{8}$ inch from edge, then plunge in tub. Take a baking powder can and perforate the lid like a pepper box and nail it to a stick. You can easily sprinkle shovels by this means without danger of inhaling fumes.

W. T. WELCH, Illinois.

A Pennsylvania Smith's Shop and Home.—I have taken "Our Journal" for nine years and can hardly wait until it comes. I do nearly a cash business. Here are some of the prices: Shoeing four and less, \$1.00, larger, \$1.25. Neverslips, \$1.75, \$2.00 and \$2.50. Calks, five cents a setting. Tire, heavy, 50 cents; light, 40 cents.



THE GENERAL SHOP AND RESIDENCE OF A PENNSYLVANIA SMITH—
MR. C. C. BUDMAN

Also clip horses for \$1.25 and \$1.50. Also keep Dr. Daniel's horse medicine on sale. I have a helper part of the time. I also have the telephone exchange of three different companies, which brings in a fair margin. So you see I can talk to nearly all of my customers. My motto is good work and price to suit; then I am not afraid of the job coming back to do over. Most of my work is horseshoeing.

C. C. BUDMAN, Pennsylvania.

Something About Welding.—Will someone kindly give me some information on welding—a little talk on welding in general, scarfing and the use of borax or other flux.

H. G. TURNER, West Virginia.

In Reply:—In regard to welding two pieces of metal at the anvil; it matters not whether it is a spring, an axle or a bolt. If proper attention is given to the way in which the scarf is made and how it is held on the anvil while making the weld there will be less failures in doing this class of work. Of course, a good clean welding heat is the main factor in the case. The scarf which is the best on a lapweld is that which is made slightly convex at the center. Such a scarf when put together will first unite at the center and from there out, making a good clean job. On the other hand, if a scarf is left hollow or with

large dents, the dirt or flux is held in the pocket thus forming and keeps the scarf from welding at that point. The outer surface of such a weld may look all right, but if broken apart when cold a black space will be found that did not weld. This is called "a loose weld." The scarf should therefore be made full at the center and a good heat taken. The piece that is placed on the anvil should project over the edge of the anvil next to the smith about $\frac{1}{2}$ or $\frac{3}{4}$ of an inch, and be held there by the helper, so that the thin edge of the scarf will not become chilled by resting on the anvil. The top weld should now be made by the smith and then quickly turning the piece over and at the same time pushing it to the middle of the anvil where the helper should bring his sledge into play. This, with reasonable speed and good heat, should give a good, sound weld.

F. H. B., New York.

Spring Manipulation in the Railroad Shop.—There is but one way to make springs and come anywhere near the manufacturer, and that is to use machinery. It is true we can't all have machinery, but

end of spring-making before long. So I have come to the conclusion that a spring is like a draw bar pin; if it is worn out in two or three places we will build the two or three places up or throw the pin away and make a new one. The same thing stands good in spring-making. Measure up your springs—see that you have the same amount of steel in pounds and in inches as when the spring was new—and if not, add a plate until you get it.

Of course we know that the companies we are working for want us to save all the material we can; and by using our rule and scales a little more we can save many a dollar that is thrown in the scrap. I do not mean to say to use old spring steel that the rust has eaten up, like a good many of the tank springs that we have to repair.

I have made a test of what a spring would come to at twenty times resetting and tempering. I took a plate, $\frac{3}{8}$ x $3\frac{1}{2}$ x $3\frac{1}{2}$ x 22 $\frac{1}{2}$; the plate weighing 8 lbs., 8 $\frac{1}{2}$ oz. After being set and tempered I had lost $\frac{1}{2}$ oz.; making the plate weigh 8 lbs., 8 oz. At twenty times setting and tempering I lost 1 lb., 8 $\frac{1}{2}$; making the plate weigh 7 lbs.; a reduction of 1 oz. and 88 parts per running inch, or 17% reduction in twenty times setting and tempering; which means that the plate was $\frac{11}{16}$ inch thick in the place of $\frac{3}{8}$, and $3\frac{1}{8}$ in place of $3\frac{1}{2}$. It is a small thing, but, brother, let us multiply that by twenty where we have a number of springs that have twenty plates in them; but we will take the 18 plates, which means $\frac{1}{8}$ the thickness of $1\frac{1}{2}$ -inch plates.

If you were to buy a new spring, and as soon as it came take a plate out of it you would have trouble on your hands right away. The only difference is—you have been stealing from spring steel every day, and wonder why the springs do not stand up when the engine comes from the works. If we would watch this end of spring-making, along with some of the methods we have in making and repairing springs, and stop some of the failures, I will assure you that the master mechanics and superintendents of motive power will greet us with a smile.

Another question was asked me one time by some school children who made our shop a visit some few months ago. "In heating those springs time after time what is destroyed?" asked one of the little fellows. I made him some sort of an answer and passed on to some other part of the shop with the crowd. But I was like the boy, I wanted to know; so I took a piece of spring steel up to our chemist and I found a partner in the case. He wanted to know, too; so we took the analysis of the steel as it was in the rack, then the analysis after twenty times treated as a spring plate.

Analysis of Steel in the Rack:

Phosphorus	.05%
Sulphur	.033%
Manganese	.28%
Carbon	.55%

After Twenty Times Treated:

Phosphorus	.05%
Sulphur	.038%
Manganese	.23%
Carbon	.50%

There is some difference, and one that has not made the material any better. The oxidation that takes place in constantly reheating and setting springs makes the spring unsatisfactory.

H. D. WRIGHT, Indiana.

if you make them by hand keep out the creases—don't draw your plates over sharp cornered tools or dies. In tempering springs the past two years a new idea has come to light, and quite a good one for those that are in the manufacturing end or where there are two, four or six fitters working—that is, drawing back in a retort. We all know that in drawing back a spring it is better to draw in a furnace at 900° F. than in a furnace at 1600° F. One man can draw for four fitters, and you can cut three men out of your fitting crew, which means one fitter and two helpers, but you have got to build your furnace for that purpose.

The furnace is so constructed that you can run at 1600° for your four fitters, and at the same time your retort will be running at about 900°, which means even a better spring at a reduced cost and greater output. You do not cool down your furnace to draw when no one is ready to turn off the oil.

One of the questions asked me was "how may we know when a spring has reached the end of its usefulness?" I was somewhat amused, for if that brother only knew how he stalled me on that question how surprised he would be. I made up my mind that I was going to find out all about that

TIMELY TALKS WITH OUR SUBSCRIBERS



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Automobile Work

Every day brings us news of other smiths adding automobile work to their lines. And there is every reason for the vehicle worker and general smith to take on this work, but you cannot do it without knowing something about the automobile. Get in touch with the Book Department—they have several new books on automobile subjects and they are anxious to explain and describe the books to you.

Oxy-Acetylene Welding

In the first place the oxy-acetylene flame is used not alone for joining and welding, but for severing and cutting as well. And if you have been reading the articles on the subject in "Our Journal" you know what a time, money and labor-saver the little flame is. Lots of smiths would like to have outfits in their shops—some have them—but most smiths "cannot see" the thousand with which to drag a plant into their shops. So—first we're going to tell you how to build a plant right in your own shop—show you how to build it at small cost. Then—we're going to tell you how to use it, how to manipulate the outfit, how to use it to turn time into money.

Horseshoers and Farriers

Our horseshoeing readers will be very much interested to know that a new series of articles from the pen of a well-known authority on shoeing start this month. Dr. Seiter is a new-comer in our columns, and his articles should prove both interesting and extremely valuable to our readers.

Thornton's Hobby

Next month will find our old friend with us again. When we asked him to favor us with another series of articles, Thornton said—"I've nothing to write about." So we suggested he write about his hobby. And the result is—well, read the first article of his new series.

Subscription Agents

When a stranger solicits your subscription to THE AMERICAN BLACKSMITH, or any other publication, insist upon his showing you absolute proof that he is an agent in good standing and is employed by the publication which he represents. Don't, under any circumstances, give the man your money if you are not sure that he really works for the paper he says he does. No matter what the man offers you—no matter what price he makes—no matter what premium he promises to send—DON'T GIVE HIM YOUR MONEY IF YOU ARE NOT SURE.

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The Long-Time Rates

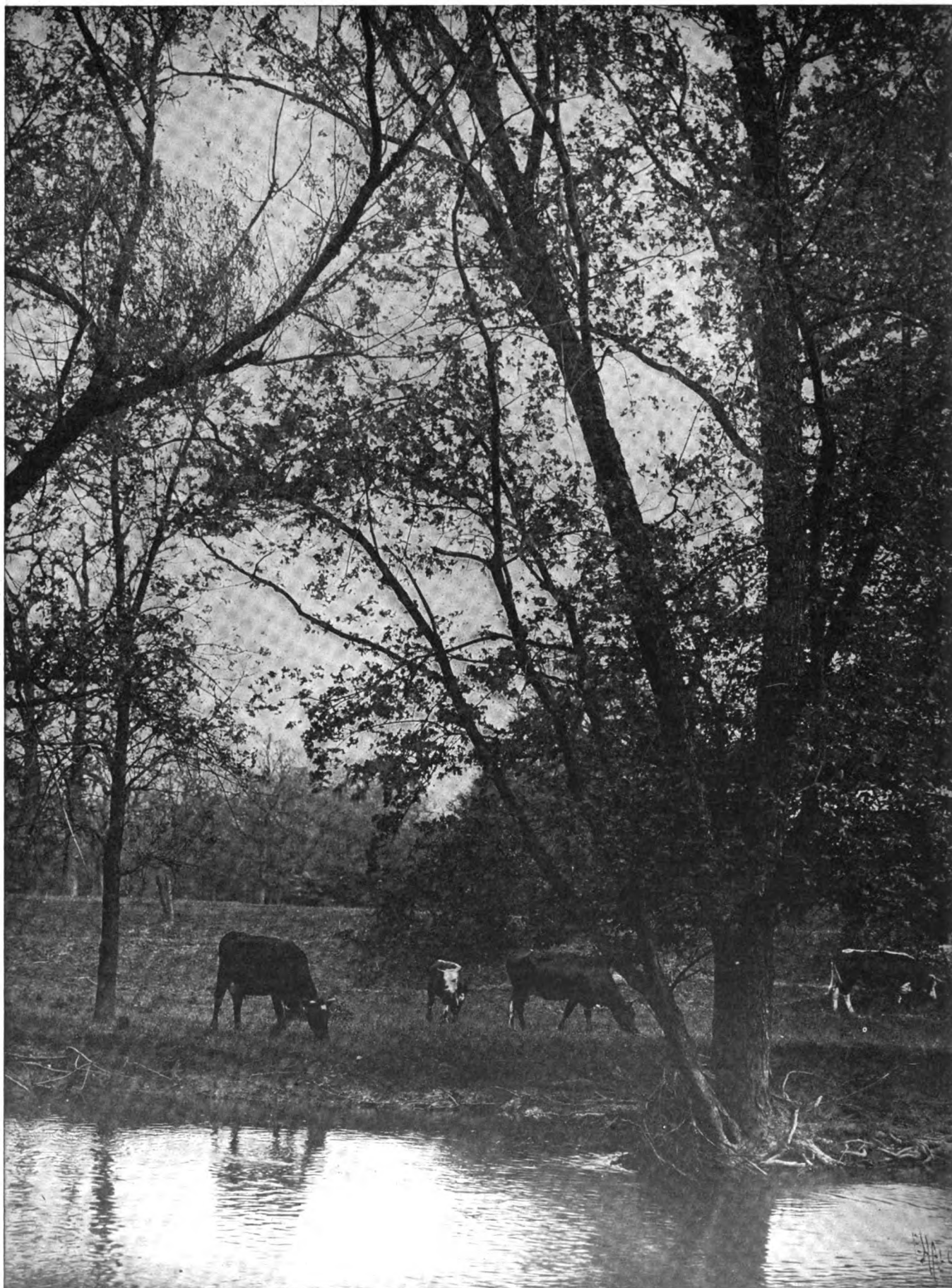
The Long-Time Rates and Our Honor Roll go hand in hand, and among the advantages offered by the combination the greatest is the money saving that is possible. Don't lose sight of that. Any way you figure, you are certain of a saving in your subscription money. And the amount you save depends entirely upon the amount you want to save. Is there any reason why you should not take advantage of these savings? There is every reason why you should. When big firms such as the Iver-Johnson Arms & Cycle Works and the Whiting Foundry Equipment Co. subscribe for a term of years in order to take advantage of the low long-time rates, is there any reason why you should hesitate? Save money, time, trouble and worry by subscribing for a long term.

Some of Our Big Folks

Here are a few names from the list of the larger firms and companies that have recently subscribed to THE AMERICAN BLACKSMITH:

Whiting Foundry Equipment Company—makers of cupolas and foundry supplies and equipment.
Meadowbank Mfg. Co., Australia—makers of agricultural implements, tramway and railroad rolling stock.
Perfection Spring Co.—makers of springs.
Moline Plow Co.—makers of plows and plow parts.
American Steel & Wire Co.—makers of everything from pins to bridges.
Iver-Johnson Arms & Cycle Works—makers of fire-arms and bicycles.
Irenstein-Arthur Koppel Co.—makers of railroad equipment of all kinds.
Goldfields Diamond Drilling Co., Australia—machinery agents and drilling contractors.
Dispatch Foundry, Australia—makers of castings, etc.
West Virginia Pulp & Paper Co.—makers of paper.
Sidney-Stevens Implement Co.—makers of farm implements.
Studebaker Bros. Mfg. Co.—makers of all kinds of vehicles from a dog cart to a limousine.
Kiloskar Brothers, India—makers of agricultural implements.

Space does not permit of the entire list of the larger firms, companies and corporations who have subscribed to THE AMERICAN BLACKSMITH, but the few names above show that "Our Journal" is recognized, read and paid for by some of the largest concerns in the country.



JUST A PICTURE FROM NATURE



Wood-Working Machines and Finishing Wood Work

A. C. GOUGH, M. E.

IN THE machine shop many operations formerly done upon the lathe, planer, shaper, etc., are now done partially or wholly with the grinder and with much greater ease, accuracy and speed. Similarly, in the carriage and repair shop when the stock to be finished is not unusually long a drum and disc sander may be used to such good advantage that the hand planer may be sometimes omitted. Of course it is true that a sander cannot surface a piece of lumber as the hand planer may; but it is also true that saws, cutters and planers do not finish the stock—rather they get it ready for the sander. Since the hand planer does not usually finish the operation, the sander is necessary; unless it is preferred to spend much time finishing the work by hand.

Surfacing is a very small part of the work which may be performed by the modern hand planer. In fact almost any shop may use the hand planer and shaper to good advantage. But when these machines are not available it has proved a very good method to prepare the stock with the band saw or table saw and the common hand tools, using the sander generously in producing a good finish.

A common difficulty met with in employing many methods, the description of which sounds good, and in using new machines which are good, is the effort required to produce and maintain the proper conditions. For instance, the band of the saw may be broken and the sander out of condition, so that it would require less effort to do the small repair job with the hand tools only, rather than to fix up the machines. Thus the good mechanic in the small shop, during the busy season, sometimes lets his equipment run down until it is about on a par with "Tom Tardy's". No doubt the best way to provide for

mechanical difficulties is to fix it so the difficulty cannot arise. The drum and disc sander is a very simple machine; and when provided with a suitable number of interchangeable drums and discs for the work in hand no particular difficulty is experienced and not much time is required in order to set up the machine for the work. Owing to the fact that sheets of sandpaper of suitable grades may be purchased from the jobbers in sizes as required, the work of preparing the abrading surfaces is very much reduced; it being necessary only to apply a coat of glue to the face of the drum or disc (glue may be applied to the back of the sandpaper as desired), then press the sandpaper evenly into position.

The grades of sandpaper should be chosen to suit the work: No. 1½ to No. 2½ may be used for fast grinding, while it is necessary to use No. 1 and finer for finishing the work.

There are a number of discs and drums upon the market provided

with means for clamping and holding the sandpaper without the use of glue. These improved parts are necessarily more expensive than the simple discs and drums employing glue to retain the abrasive material; and while many of them produce good results there is still opportunity for improvement in this direction. Perhaps some of the other readers of *THE AMERICAN BLACKSMITH* have developed something special along this line.

The speed of the sander is limited by the heating of the work. This renders it better practice to employ step-cone pulleys for driving the sanding machines—very much after the manner of the wood turning lathe. The limits between which the speed of the abrading surface might vary may be taken between 1500 ft. and 4000 ft. per minute, depending upon the pressure between the work and the abrading surface.

The drum and disc sander and face plate lathe, as illustrated by the

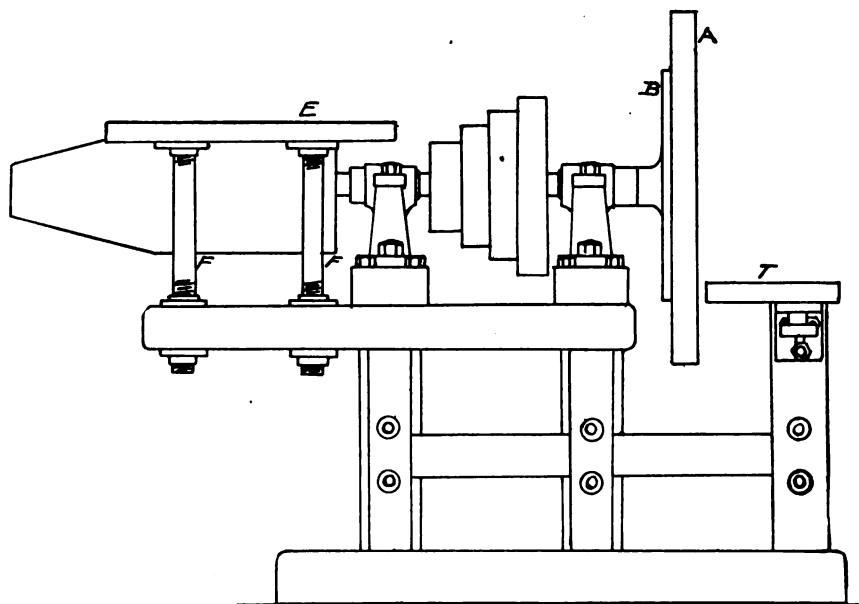


FIG. 1—A DRUM AND DISC SANDER FOR THE WOOD SHOP

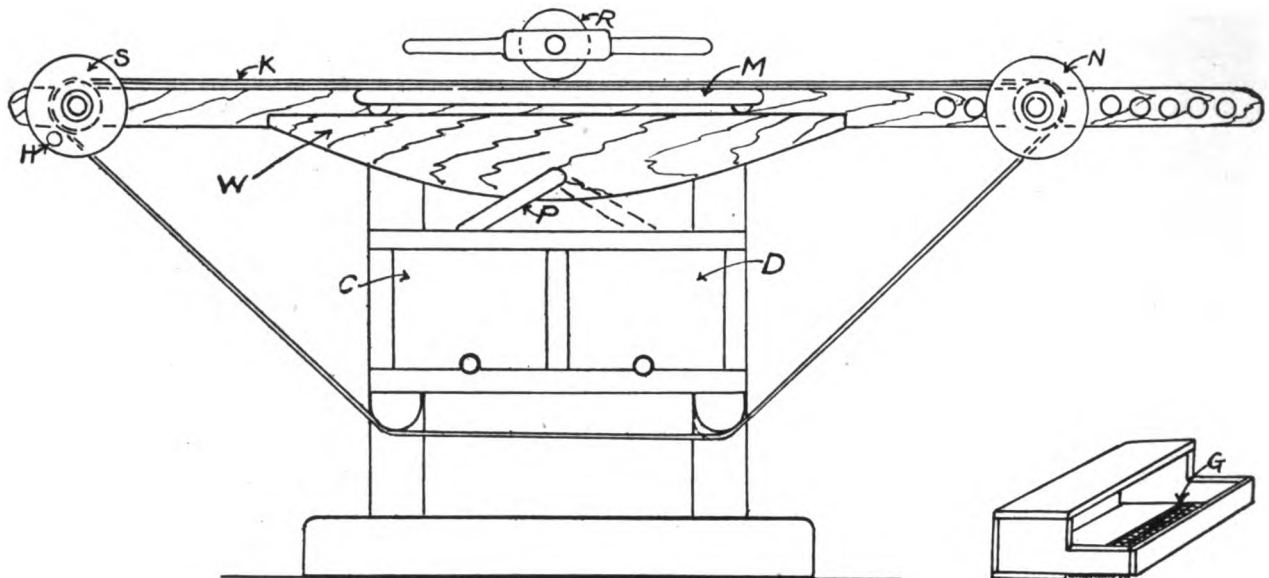


FIG. 2—THE SUCCESS OF A SAND-BELT MACHINE DEPENDS GREATLY ON THE EFFICIENCY OF THE BELT.
FIG. 3—SHOWS A SANDING RIDDLE

accompanying drawing, Fig. 1, is designed along lines which may render it easy of construction in the general repair shop. An effort is made to employ the material in the best manner, using material which may usually be in stock. When

a longer shaft to carry the drum.

It will usually be desirable to possess a number of face plates, B. The discs, A, may be built up of light, strong wood and secured to the face plate by means of wood screws or bolts and nuts—the nuts

a threaded iron core. The core or sleeve should extend well into the drum, being threaded at the interior end, the shaft fitting the hole in the sleeve snugly and with the end threaded to match the threads in the sleeve.

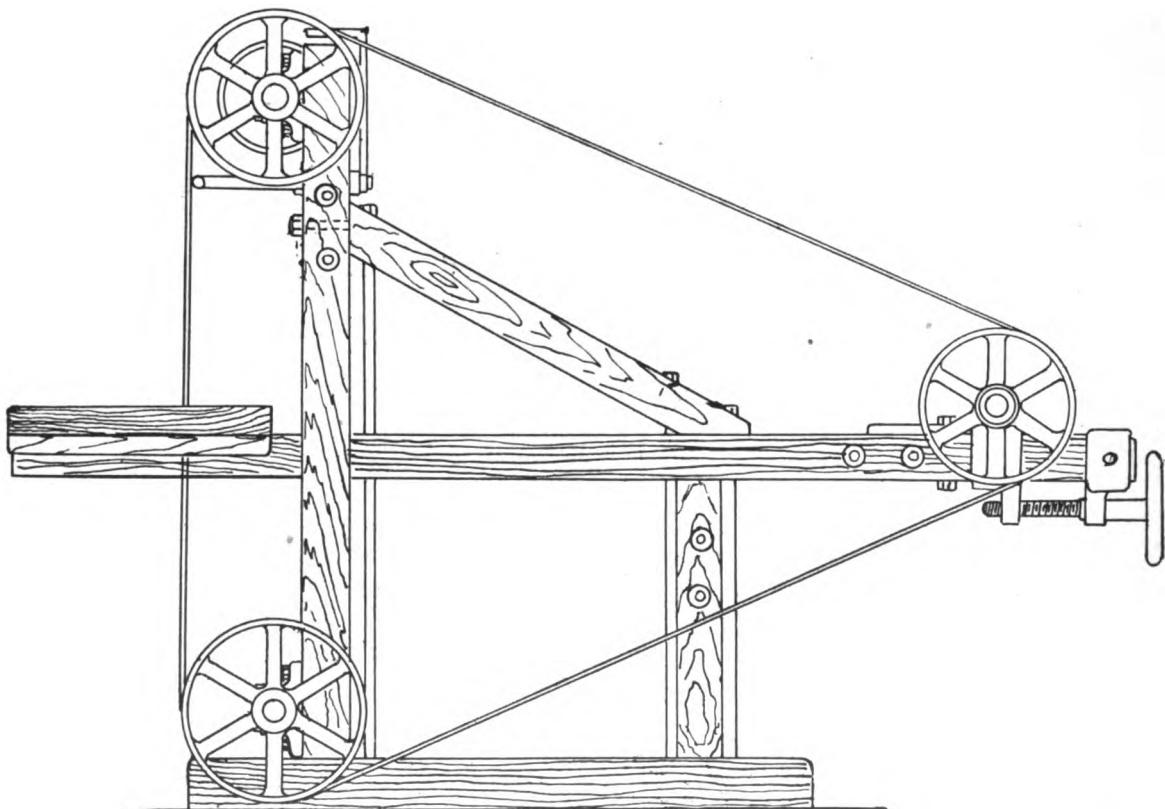


FIG. 4—HERE THE FEATURES OF THE VERTICAL AND HORIZONTAL BELT SANDERS ARE COMBINED

desirable, the head stock, step-cone pulley and face plates of a good size lathe may be used. This method would not require very much machine work, further than putting in

being sunk. The edge of the disc, A, may be turned true and also used for certain work. The long drum, somewhat tapered at one end, should be built up of light, strong wood upon

In order that the machine may be used as a table drum sander, a table, E, may be provided. The table is supported by four upright wrought-iron pipes, F, F, upon which it is



secured. The lower flanges which secure the pipes to the frame may be arranged to be turned with a special spanner wrench. It is not considered necessary to provide other means for the small vertical adjustment required.

It will be found better practice to cover the surfaces, which carry the abrasive material, first with rubber, spongy leather or felt. If this is done the abrasive material will not

ment may be secured. It would be necessary to allow some space between the table and face plate, in order to provide room for the work.

This common difficulty of keeping machine tools in the proper condition for use is rather greater in the case of the belt sander. This is especially true when the common method is employed. For instance, several years ago the writer consulted a firm of jobbers and engineers re-

convenient removal of the abrading belt. Two machines resulted that were made without this provision, which rendered this method of finishing carriage wood work rather unpopular in that particular shop. First, the bottom of the riddle being too large, a portion of the crushed quartz was wasted; second, the operation of spanking in the material is rather tedious and not altogether satisfactory; third, the

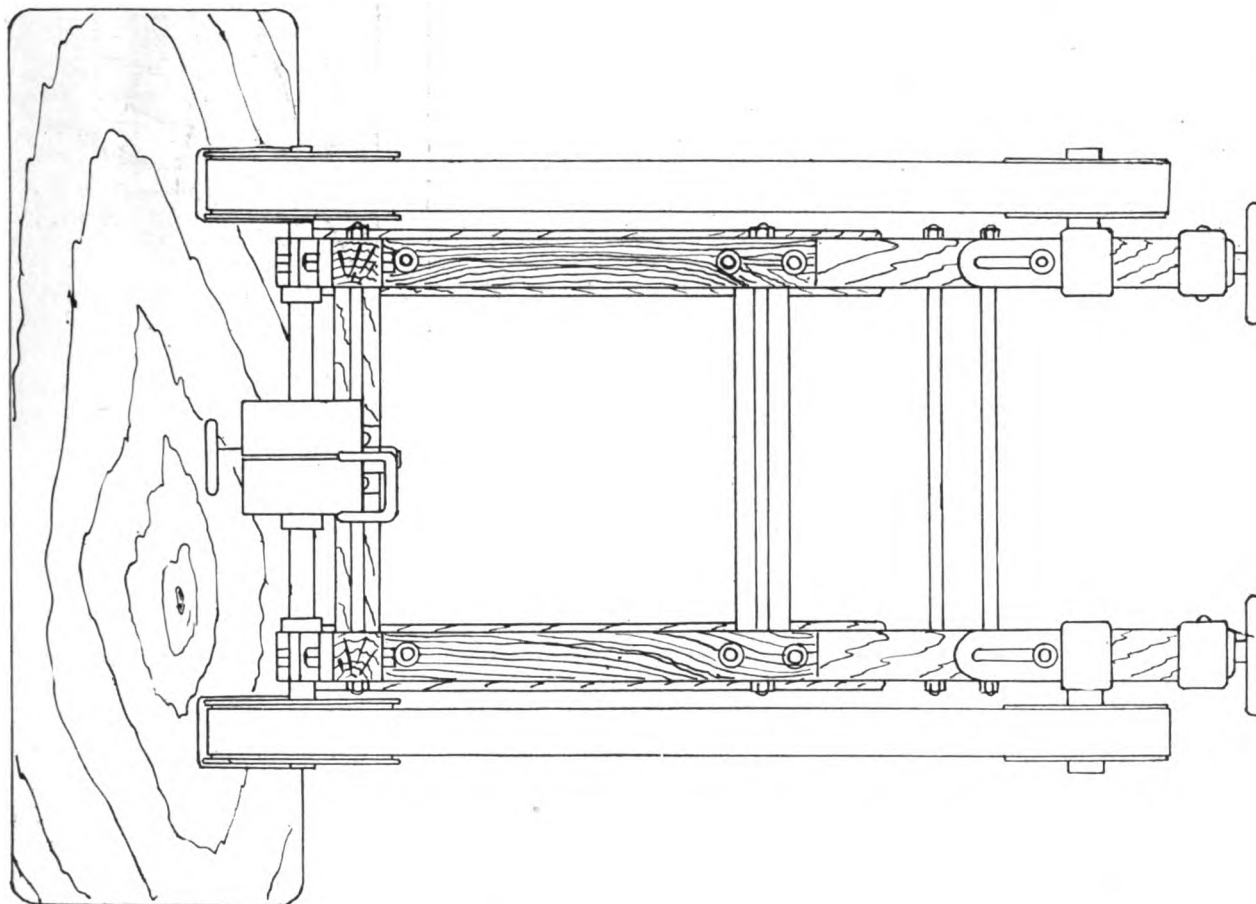


FIG. 5—THE MACHINE MAY BE CONSTRUCTED TO USE BUT ONE BELT, ALTHOUGH IT IS BETTER PRACTICE TO EMPLOY TWO BELTS

peel off so quickly, will not heat in spots so readily and the work will have a better finish. If a number of discs and drums are provided—necessary for the suitable grades of abrasive material—the too common difficulty of not having a machine ready when wanted for use may be avoided.

The table, T, may be secured upon the upright pieces by a bolt at each end with hand nuts, as shown. When it is desired to use the machine as a face plate lathe the table, T, may be replaced by a table less wide, upon which may be secured (in a slot provided) a lathe rest. By having the table and the rest slotted, any necessary adjust-

garding the use of a belt sander and was informed that the common and practical method of preparing the abrading belt consisted of the following operation: Apply glue with a brush to the canvas belt, sprinkle the abrasive material upon the surface covered with glue and then spank the abrasive material into the glue with a thin board. When the belt was completed in this way it should be allowed to dry for a few hours.

It is not with the intention of casting the blame upon anyone else for the difficulties met with in applying the above method; but the advice permitted the use of machines which had no provision for the easy and

glue used became too hard unless the belt was used enough to wear out the abrading surface in a few days.

The first experience to discourage was when starting up the machine on one occasion there was a shower of crushed quartz in that vicinity. It was found that this was due to using glue which set too hard, and also to the high speed of the belt. A proper glue was obtained and the speed of the machine was lowered, which made it possible to use the machine with fairly good results when the abrading belts were in fit condition.

These experiences went far to convince one that in introducing new



methods and machines it is a good idea not to omit too much. In fact, machines are often not used—entirely neglected—because no provision has been made for keeping them in working condition. In this connection the scheme, illustrated in Figs. 2 and 3, is offered for preparing the surface of abrading belts.

The apparatus consists of a frame which supports a trough, W, directly over which is a table, M. At the ends of the frame are two spools, S and N. Provision is made for adjusting the position of one of the spools when preparing belts of various lengths. For the operation, the belt is placed over the spools and table as shown at K; glue may be applied to a portion of the belt, which may be brought into position over the table by turning the spool by means of the handle, H, when the abrasive material may be applied by means of a riddle and fixed in the glue with a hand roller. This roller, R, may be of hard cast iron or other material and should be provided with a frame suitable for handling with one or both hands.

The purpose of the trough, W, is to catch the abrasive material which misses or falls off the belt during the operation. The trough may be fitted with a piece of rubber hose, P, which may be placed over the cabinet, C, or D, as may be desired. When compartments such as C and D are arranged for the different grades of abrasive material required, the rubber hose or other means may be used to direct the surplus abrasive material back into the compartment designed for that particular grade. In fact this is only a suggestion, as the supporting frame may consist of a cabinet with compartments for the different grades of crushed quartz, emery, glue, belts, etc.

When it is desired, drums and wheels may be coated with crushed quartz or emery by first giving them a coat of glue and then rolling them along in the trough, W, which should be partly filled with the grade of abrasive material desired. In this case it would be necessary to make provision for removing the table, M, and for closing up the opening in the bottom of the trough. It should not be forgotten that it is necessary to make provision for emptying the trough by elevating the bottom opposite the opening and to elevate

the bottom of the compartments upon three sides, not including that of the opening. When nothing better is desired, the openings of the compartments may be simply round holes, closed by wooden plugs.

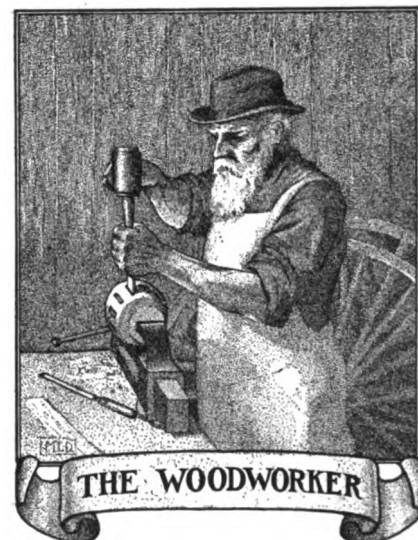
Fig. 3 illustrates a cheap, but (it is believed) the best form of riddle for this particular work. It may be constructed something like a light, strong box with one quarter and the side opposite removed; the side being replaced by a screen, G, of the proper mesh. When carried vertically the box holds the material just as any box might do, but when turned over, as shown, the abrasive material flows out over the screen and falls upon the belt. The box may be made such that the screen is about the same width as the belt, so not much of the abrasive material will miss the belt when in use.

While this form of auxiliary apparatus has not been used, so far as is known at this writing, it is believed that in conjunction with a sufficiently large number of belts, etc., it will largely remove the common difficulty referred to elsewhere.

The design shown in Figs. 4 and 5 combines the features of the vertical and horizontal belt sander; only it is necessary to place the table somewhat lower than is usual with machines in order that the more nearly horizontal portion of the belt may not be too high for convenient use. The machine may be constructed to use only one belt, but it is better practice to employ two belts, one for fast grinding and one for producing the finish. It is better, also, to provide one or more duplicate belts, in order that one belt may always be ready for use.

The machine is shown with tight and loose pulley for driving, though it may be considered desirable to use step-cone pulleys instead.

The material selected and the manner of employing it has been done with the view of the machine being constructed in the repair shop.

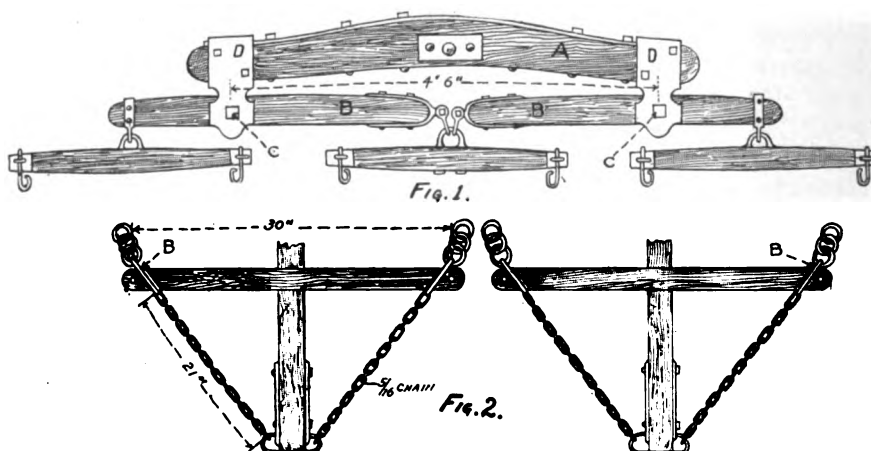


Three-Horse Eveners and How to Make Them

The following directions with the accompanying engravings showing how to make and proportion three-horse equalizers are republished for the benefit of several recent querists.

The equalizer shown in Fig. 1 is described by Mr. Nels Peterson as follows:

The doubletree at A is made like any other doubletree for a two-horse wagon, except that it is longer and of course somewhat heavier; being 4 feet 6 inches long. The eveners,



THIS THREE-HORSE EVENER IS MADE ON THE LINES OF A DOUBLETREE



BB, are 33 inches long and divided so that two thirds of their lengths are inside the draw-pins, CC. The two clevises shown at DD are made of $4\frac{1}{2}$ by $\frac{1}{8}$ -inch iron, and to give them a neat appearance the edges of the top sides are cut out with a gouge and the points are rounded as shown. A heavy plate, 2 by $\frac{1}{8}$ inch, is fitted and bolted to the back of the doubletree, and a hook is to be turned up on each end to keep the clevises in place. These eveners can be used with one pole, only, and that in the center. You will note that the middle horse is placed directly in front of the center of the wagon,

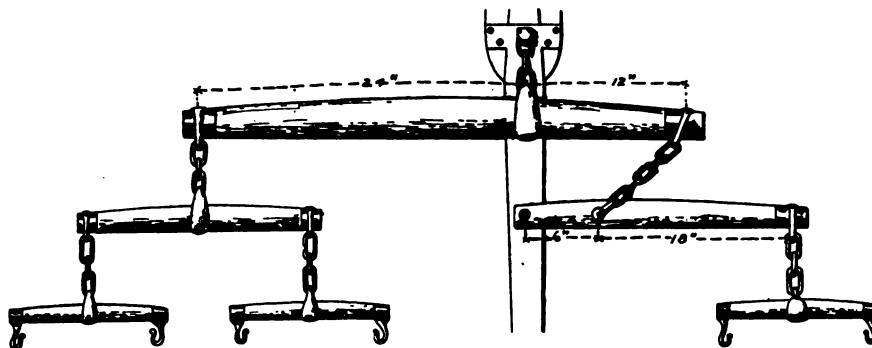


FIG. 4—A THREE-HORSE EVENER FOR USE WITH A SINGLE POLE

attached to the middle horse. To prevent the chains from pulling the horses together a spreader-bar is made, 30 inches long. This is cut down at the ends to fit the long links of the chains at B, Fig. 2. A pin is inserted in the hole outside of the link as shown.

The three-horse evener in Fig. 4 is by Mr. E. A. Wright. This equalizer is for use in connection with a single pole, and works very well on either a wagon or harrow.

In Fig. 5 is still another equalizer. This one is by Mr. James Wallace. It is for use especially on a plow or harrow where there is no pole. The equalizers are of 2 by $\frac{3}{8}$ -inch iron and are about 18 inches long, with the holes punched one third of the distance from the ends. An old singletree iron welded on the long end of each iron bar will be strong enough. On the short end a heavier hook is needed, and this is supplemented by a small clevis and a ring for the middle of the singletrees. This arrangement can be applied to any two-horse whiffletrees in a few minutes. By using this plan and crossing the traces the inside horse will have plenty of room.

new, and the gauge looks practically the same as may be found in many repair shops; but it is believed if the method illustrated here is properly employed that the spokes may be set uniformly in the proper relative position to the wheel bearing with greater ease and accuracy.

In order to have the rod centered within the wheel bearing it is necessary to provide a frustrum of a cone or bushing with a bore which fits the rod snugly; the bushing made to fit the wheel box snugly practically throughout the length of the box. When it is attempted to employ only one bushing in each case for centering the rod it would really be necessary to provide a special bushing to fit each wheel. By making the bushing in two separate parts, C and P, Fig. 1, with suitable coil springs, S and O, to force the bushings into their proper positions, it will not require nearly so many bushings to be kept in stock. A few sets of bushings made of hard wood, provided with suitable coil springs as shown, will be sufficient for wagon work. For carriage work, a smaller rod, R, should be used and the bushings should be turned out of brass or strong fiber.

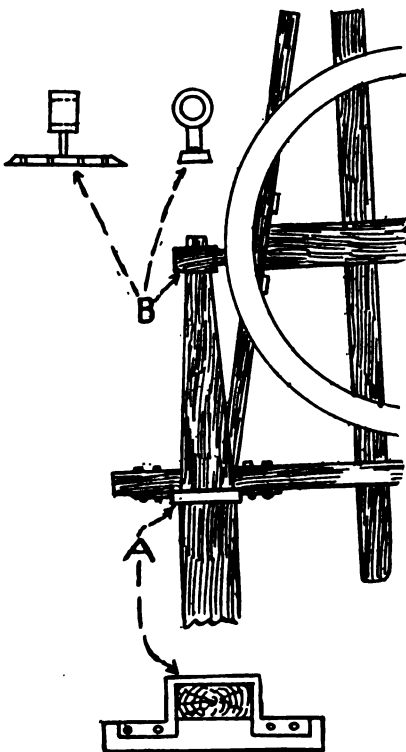


FIG. 3—HOW THE POLES ARE ATTACHED

and for that reason two poles are used.

Three-horse trucks are sometimes built with a double set of hounds; but any two-horse truck can readily be converted into a three-horse truck and still be available for two horses by simply changing the doubletree and pole. In Fig. 3 is shown the attachments and the way they are put on. A socket, A, is bolted to the splinter-bar and made to fit the pole. Another socket, B, for the back end of the pole is bolted to the side hound as shown. No neckyoke is used; the pole-chains answering the purpose of holdbacks. The two inside pole-chains shown at A, Fig. 2, being

Combined Boring Machine and Wheel Bench

A. C. GOUGE, M. E.

The method of securing the wheel upon the bench is not altogether

The rod, R, should be as large as may be conveniently used, and really should be machined and have a square thread. If the rod is strong it will not be so easily deflected and, if it has a square thread, the bushing, B, secured in the end of the driving gauge, G, may fit snugly and yet be

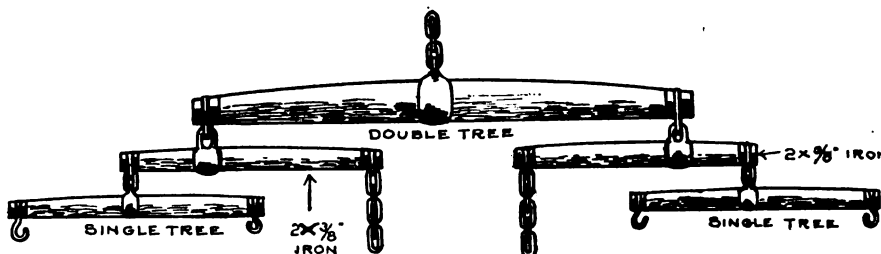


FIG. 5—A THREE-HORSE EVENER FOR USE WITHOUT A POLE



easily placed upon or removed from the rod, R (the bushing is not threaded).

This form of driving gauge possesses the advantage that it may be easily removed without releasing the wheel.

The combined boring machine and wheel bench illustrated in Figs. 2 and 3 is offered with the hope that it may in some instances render the further operations more easily and accurately performed. In the design shown here, the frame is made of wood, and the parts may be forgings; except the bearings and pulleys. Some sacrifice in the appearance of the design has been made in order that the machine might be more easily constructed in the general repair shop. Of course, the possibilities of any design have greater or less limits; this is no exception; and those who do that sort of thing may alter the design to suit their own particular taste.

As a boring machine this possesses the advantage of being set to bore holes at almost any angle. There are two straps bent to form circular arcs which are secured to the arms and may be clamped to the frame at any desired position as shown in Fig. 3. These may be graduated when desired for greater convenience in setting the machine.

Fig. 2 shows the machine arranged for boring fellos. This requires an

the hub they may be cut off at the hub and partly removed by boring holes in them with the machine, and the operation completed by pinching out the pieces with chisels—this appears to be the usual and the most practicable method of removing broken spokes.

After the new spokes have been sized and driven they may be cut off by a small circular saw, carried by a special arbor, as illustrated; the collar upon the spindle may be set to secure uniform and proper length. In order to carry this circular saw without considerable vibration, the boring machine should be rather heavy, especially the spindle and its bearings. It will usually be necessary to provide a bushing or sleeve to reduce the hole in the spindle to fit the bits and other tools. After the spokes have been cut to uniform length, the spoke pointer and tenoner are respectively used, and the fellos put on and finished before it is necessary to remove the wheel. The wheel may be raised or lowered by means of thin slotted pieces as shown by J and K in Fig. 1.

Those who are familiar with this line of work will readily understand

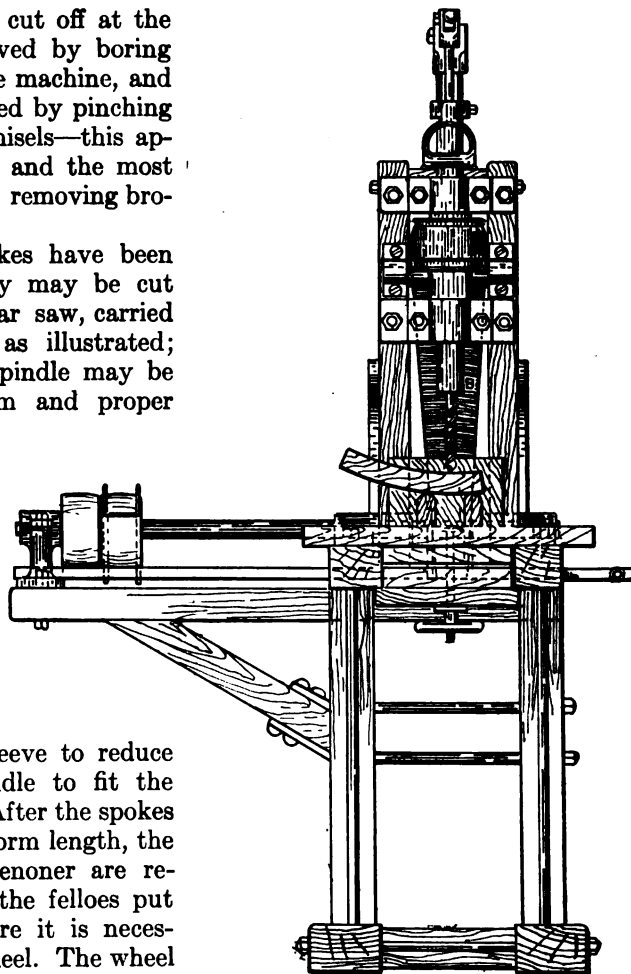


FIG. 2—THE MACHINE VIEWED FROM THE FRONT

the machine and appreciate the wide range of work which it may perform, without detailed description. However, it might be well to note that the arms hinge upon the bearings and not upon the shaft which carries the driving pulley, as this mistake has been made by one party who copied a previous design.

What It Costs To Do Business

A. M. BURROUGHS

Until recently, retail grocers in a certain Western city were paying \$1.40 for a 50-pound sack of flour, which they were selling for \$1.55. This allowed them a gross profit of only fifteen cents per sack.

The Retail Grocers' Association in this Western city took up this problem in a special convention. Most of the grocers agreed that this fifteen cents did not allow a profit, though a few were of the opinion that they were making a little on it.

The result of the discussion was an investigation into the cost of

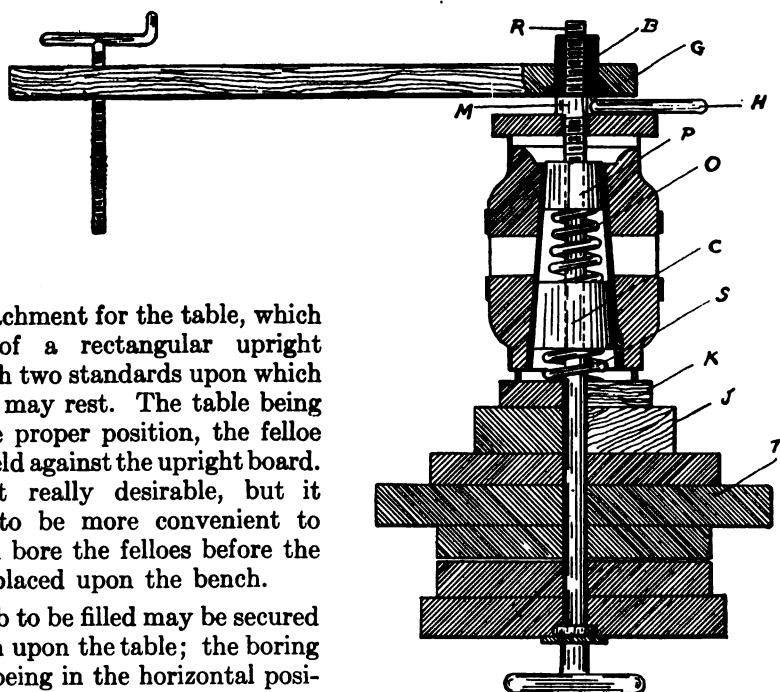


FIG. 1—A SECTION OF HUB HOLDING ARRANGEMENT

extra attachment for the table, which consists of a rectangular upright board with two standards upon which the felloe may rest. The table being set at the proper position, the felloe is to be held against the upright board. It is not really desirable, but it happens to be more convenient to mark and bore the fellos before the wheel is placed upon the bench.

The hub to be filled may be secured in position upon the table; the boring machine being in the horizontal position as shown in Fig. 3. Should there have remained any broken spokes in



doing business in that city. When the different grocers began producing their books to show their expenses, a very wide range of costs were shown.

Some of them had cost systems and declared it cost them 22% to 25% to do business. A few, while admitting that their systems were not very complete, estimated their costs at 10% to 12%.

The final result of the investigation was an agreement (those who *knew* didn't "agree") upon the average of 15% as the proper and correct cost of doing business.

But this average was plainly incorrect because the low figures ranging around eleven and twelve and thirteen per cent were from the stores of grocers who did not figure to make anything over a reasonable salary for themselves; who did not figure to make anything on the investment in the store buildings they happened to own; who did not figure for interest on their investments, and who overlooked a score or more important items that should be included in the expenses.

The high percentages, ranging around twenty to twenty-five per cent, were from the stores of retailers who had applied a searching cost system to their business. These merchants were charging up to their business every item that could be considered as expense and it made their expenses seem high.

The investigators took these high percentages, which were about correct, and the low percentages, which were eight or ten to fifteen per cent too low, and combined the whole list to arrive at the *average* of *fifteen* per cent. Now a good many retailers who think they are fixing prices right, are puzzling over their failure to find the profit they expected last year.

The cost of doing business is, of course, just the same whether a merchant includes all of the items or only a few of them in his expense account.

The only difference is that he deludes himself into thinking that the cost of doing business is only 15% when in reality it probably is 20% to 25%.

If he fools himself in this way, and figures for a 10% profit, the chances are that the expenses and the extra cost of doing business, *which he hasn't*

figured into his percentages, will eat up that profit, and leave him holding the sack at the end of the year.

A Cleveland smith thought he was clearing \$100 a month, \$1,200 a year, over and above his expenses.

But the \$100 a month included his own salary, the interest on his investment, the salary of his wife who did the bookkeeping and a number of other items.

If the smith had allowed himself interest on his investment, that

hands of a broker, and had an accountant go over the books to place a value on the stock and to see what the business was worth.

The accountant's report showed that no charge had been made for salaries. The smith, his wife and two sons ran the shop. When proper allowance was made for salaries, the shop was found to be paying a fraction over one-half of one per cent a year on the investment.

Instead of a fairly profitable busi-

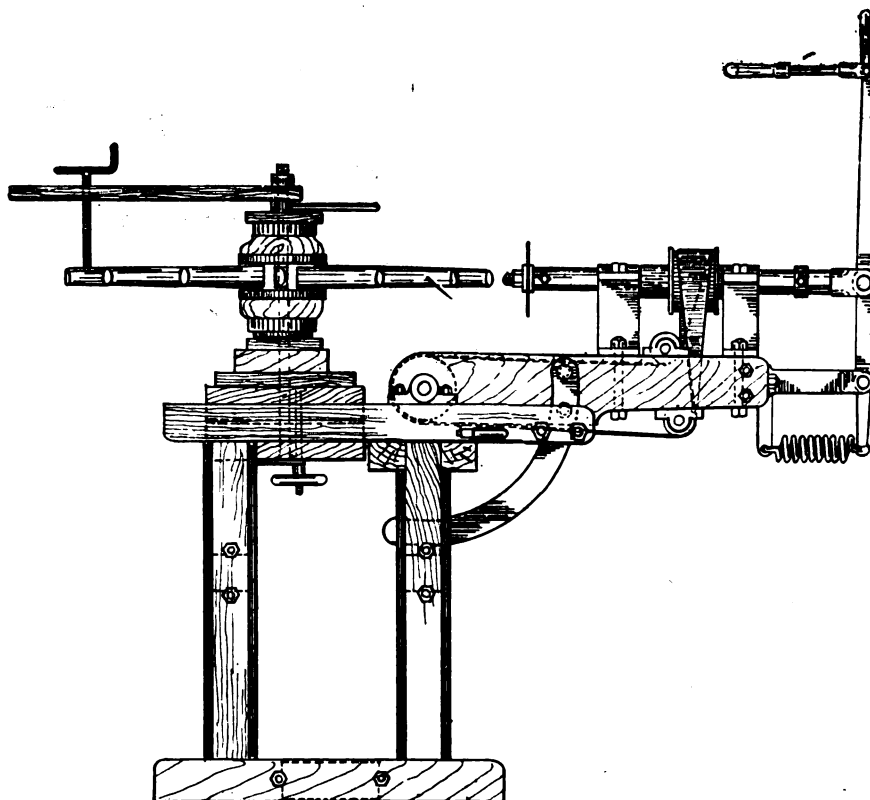


FIG. 3—THE COMBINED BORING MACHINE AND WHEEL BENCH FROM THE SIDE

alone would have produced \$50 a month without risk or worry.

Another \$25 a month of his "profits" rightly came out as expenses incurred in running the shop. He had charged several expense items as "investment."

Instead of making \$100 a month clear, he was not only failing to make anything, but he and his wife were both working for almost nothing.

If they had both worked in some other business they might have earned \$100; so instead of making \$100 they were losing \$100 a month.

A smith-shop owner was interested in politics. Last year he succeeded in landing a city job, paying him \$2,500 a year.

When he got this job he decided to sell his shop. He placed it in the

ness, one salable at a premium for good will, it was found to be a business so nearly *unprofitable* as to be unsalable.

Fixtures and stock were finally sold at a loss. Nothing was received for good will, because there was no good will—only a chance to work for nothing and take the ordinary business risks besides.

In scientifically managed businesses it has been found that the salaries of the clerks average around nine per cent of the gross sales by those clerks.

The salaries of managers, bookkeepers and other employees, who do not sell, run the average cost for salaries up to about thirteen to thirteen and a half per cent of the gross sales.



Rent is likely to average around four per cent, delivery around one and a half to two per cent, light and heat from one to two per cent, and so on down the list of expenses.

No business man, as he so frequently does, should *assume* these percentages to be his costs. He should get his *own* costs from his *own* business, considering these percentages only as standards by which to judge whether he is higher or lower than the average.

The smith who would know his cost of doing business should classify his expenses into such accounts as will give him the information he needs.

He should install a cost system that will search out all of the expenses and enable him to know, not merely a *few* of the things which he pays for, but *all* of the things which enter into his cost of doing business.

Here is a list of the expenses used by one wide-awake smith:

Rent—if the building is leased; depreciation or upkeep if it is owned.

Salary—of all employees, and the manager.

Light.

Heat.

Advertising—in newspapers, circulars, etc.

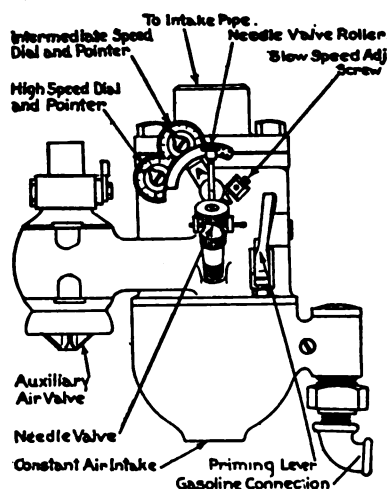


FIG. 1—THE CARBURETOR AND ADJUSTING PARTS

Printing—stationery, blank books, bill heads, etc.

Gifts—presents, donations, etc.

Telephone and telegraph tolls.

Insurance—stock, fixtures, etc.

Taxes—on stock, equipment, etc.

Interest—paid out.

Breakage and spoilage of stock.

Repairs—on equipment, etc.

Depreciation on equipment, etc.

Bad accounts.

Goods stolen from stock.

Depreciation from cost price by the purchase of unsalable stock which makes it necessary to reduce prices.

Some add freight and cartage to this list, but it should not be charged as an expense. It is a part of the original cost of the goods and should be charged to goods and not to expense.

(Copyright, Burroughs Adding Machine Co.)



The Care, Repair and Operation of the Automobile—2*

(With Special Reference to Overland Cars)
Adjusting the Carburetor

Always before changing carburetor adjustments make certain that the fault is not elsewhere.

First seat the needle-valve, by turning the needle-valve (Fig. 1) adjusting screw to the right until it stops. Do not use pressure on the screw after it meets with resistance. Then turn it to the left about a turn and a half, and prime or flood the carburetor by pulling on the priming lever and holding it for about five seconds.

Open the throttle by moving the hand throttle lever about two thirds across the quadrant: After this, close the throttle slightly, retard the spark and adjust the throttle-lever screw and the needle-valve

(*Copyright by Willys-Overland Co.)

adjusting screw until the motor runs at the desired speed and hits regularly on all four cylinders.

When you have secured a good adjustment, with the motor running idle for low speed, do not touch the needle-valve adjustment again, but make the intermediate-speed and high-speed adjustments on the dials shown in Fig. 1. First adjust the pointer on the intermediate-speed dial, moving it from the figure 1 toward the figure 3, about half way between.

Now, advance the spark and open the throttle so that the roller on the track running below the dials is in line with the intermediate-speed dial. If the motor backfires with the throttle in this position, and the spark advanced, increase the gas supply by turning the indicator a little more toward the figure 3 on the dial; or, if the mixture is too rich, cut down the gas supply by turning the indicator back, or towards the figure 1 on the indicator, until you are satisfied that the motor is running properly with the throttle in this position or on the intermediate speed.

Finally, open the throttle wide and make the adjustment on the high-speed dial for high speed in the same manner as you have made the adjustment for intermediate speed on the intermediate-speed dial.

In adjusting the carburetor in this manner there is a tendency to give too rich a mixture. Therefore, it is advisable in making adjustments for low, intermediate and high speeds to cut down the gasoline until the motor begins to cough back into the carburetor, and then to increase the fuel supply, one notch at a time, until the motor hits evenly on four cylinders.

Never increase the gasoline supply in the low-speed adjustment by turning the needle-valve adjusting screw more than one notch at a time, and

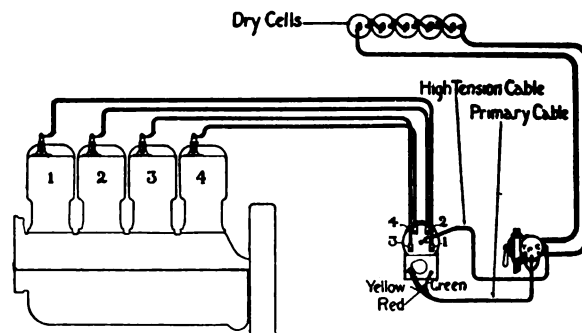


FIG. 2—THE IGNITION SYSTEM MADE PLAIN

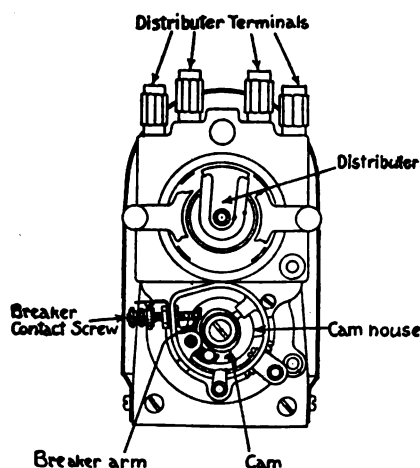


FIG. 3—THE MAGNETO BREAKER AND DISTRIBUTOR

do not turn it again once that you have it so that the motor fires regularly.

In making the adjustment on the intermediate and high-speed dials do not turn the pointer more than half way at a time between the graduated divisions or marks shown on the dial.

The air-intake of the carburetor is piped to the exhaust manifold where the air is heated to secure better vaporization of the gasoline. A shutter valve connected to a wire, ending in a ring and passing through the radiator, may be closed when it is desired to secure a mixture rich in gasoline for easier starting in cold weather. A similar purpose is served by the auxiliary air-intake valve which is operated by a small lever mounted on the dash. When this lever is moved upward, the tension of the auxiliary air-valve spring is increased, which has the effect of making the mixture somewhat richer. This lever is little used in average running, but becomes useful when it is desired to adjust the mixture for changes in atmospheric conditions.

Another method of securing a start of the motor under adverse conditions is to press down the flushing lever or "tickler" of the carburetor (Fig. 1). Do not press the "tickler" longer than about five seconds, else the inlet manifold may be filled with almost pure gasoline vapor, on which the motor will not start. When such flooding occurs, open the petcocks and turn the motor briskly by hand, which will relieve it of the excess vapor.

For average running, a mixture lean in gasoline will give more power and greater motor speed than a rich one.

Before hunting for carburetor troubles, fancied or real, see that there is gasoline in the tank and that the shut-off valve of the sediment cup is open. If the carburetor is flooded, clear it by revolving the motor with ignition off and petcocks open. If the float should have become "logged", remove, dry and give it a new coating of shellac; but this is seldom necessary.

Ignition System

Ignition current for starting is furnished by a battery of dry cells in some cars and by a storage battery in others. A magneto and non-vibrating coil furnish the current for regular running in both.

The dry cells are connected in series as shown in the wiring diagram of Fig. 2; the carbon of one cell being connected with the zinc of the next one.

When the dry cells are old and no longer give off the current for starting the motor it is necessary to

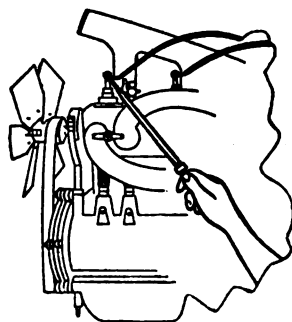


FIG. 4—HOW TO LOCATE A "MISSING" CYLINDER

get a new battery. It is possible, however, to bring old dry cells back to temporary life by punching a hole into the wax that seals the top of the cells and pouring salt water or vinegar into it until the paste of the cell is moistened sufficiently to give off current. Even plain water will have a temporary revivifying effect on the cells when they are treated in this way.

Battery and magneto currents are controlled by means of an ignition switch on the dashboard.

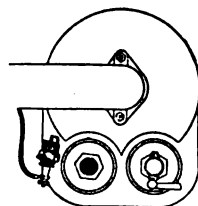


FIG. 5—TESTING THE SPARK

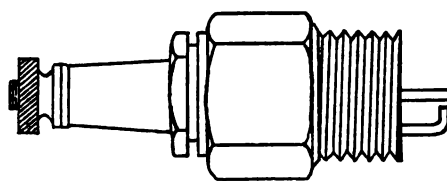


FIG. 6—THE GAP BETWEEN THE SPARK-PLUG POINTS MUST BE CORRECT

Spark Plugs

The proper condition of the spark plugs is of importance, because the spark gap of the plug constitutes the business end of the entire ignition system.

Owing to the fact that the spark plugs are located above the intake valves, where their points are constantly swept by the inrushing fresh charge, little or no trouble will be experienced from sooting of the plugs. An excess of oil or oil of poor quality will in time soot and short-circuit the sparking points. When this occurs, the points should be cleaned with an old toothbrush dipped in gasoline.

It is a good plan to carry a few extra spark plugs in your tool kit, to avoid the necessity for cleaning sooted plugs on the road.

Spark-Plug Adjustment

Before a spark plug is seated, care should be taken to have the spark gap just right. The points should be just $\frac{1}{8}$ inch apart.

If the motor misses when under light load, the spark gap should be wider; and the points should be brought closer together if the motor misses under heavy load and when running at low speeds.

Failure of the ignition system may be caused by a break in the wiring or by wearing off of the insulation.

A successful method of finding a short-circuit is to start the motor in a very dark place where a blue flicker will indicate the location of the short-circuit.

Induction Coil

The purpose of the coil is that of "stepping up" the primary current from the battery or magneto or covering it from a current of low tension into one of high tension. Outside of some attention to the binding posts, to see that the wires are screwed tight upon them, no adjustment of the coil is required.

Magneto

The principle of operation of the magneto is as follows:



The turning of the armature in the field of the magneto produces a low-tension current in the magneto winding. The interruption of the primary circuit by the circuit breaker induces a high-tension current in the dashboard coil which is carried to the distributor and thence to the cylinder in their firing order, which is 1-3-4-2.

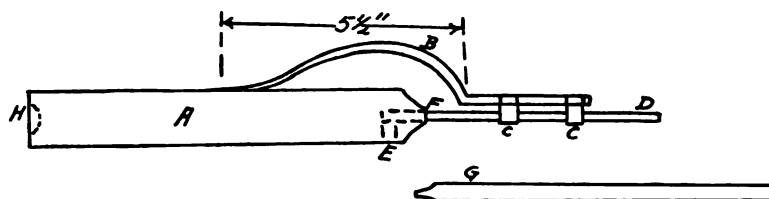
The magneto is to be timed with the motor by the "break" of the contact points. With the cam house fully retarded and the flywheel one inch past dead center the platinum points of the breaker must be separa-

nal. (See wiring diagram, Fig. 2.)

There is only one adjustment; that of the breaker contact screw (Fig. 3).

Keep oil away from the breaker contact points.

Don't take the magneto apart.



AN EASILY MADE BOW SOCKET RIVET PUNCH

The adjustment should be made so that the maximum break of the platinum points is between .025 and .030 inch.

If anything goes wrong, consult an expert or send it to the makers.

Determining Which Cylinder Misses

When a noticeable loss of power and irregularity in the explosions indicate that one of the cylinders is "missing," the problem is to find out which of them fails to perform its duty.

Open the priming cocks. Watch for the flame shooting out of each opening and listen for the sharp reports of the explosions. The cylinder without flame, out of which issues only a hiss but no sharp report, is the one at fault.

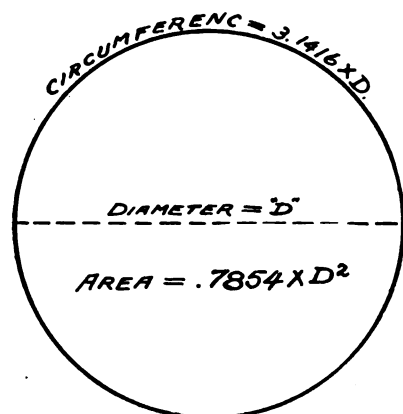
An even more reliable method is that of short-circuiting one cylinder after another. This may be done by holding a screwdriver or other instrument so that it will make connection between the head of the spark plug and some part of the motor. (See Fig. 4.) Hold the screwdriver by its wooden handle, else you may receive a shock from the ignition current. If you in this way short-circuit one of the cylinders that is working properly you will cause the motor to run on only two cylinders; but as soon as you reach the one that is short-circuiting it will make no difference in the running of the motor, and you will have located the cylinder that fails to fire.

Stop the motor, unscrew the spark plug, leaving the wire on it and lay it on top of the cylinder as shown in Fig. 5 in such a way that only the threaded metal body of the plug, but not its head where the wire is attached, touches the cylinder.

Clean the plug, which may be done with an old toothbrush dipped in gasoline, and see whether the points are just $\frac{1}{16}$ of an inch apart (Fig. 6). Throw the switch on "Battery" and turn the motor over slowly by hand to see whether a spark occurs at the gap. If not, try a new plug, and if there is still no result trace the wiring and watch for worn-off

Dia. In.	Cir. In.	Area Sq. In.	Dia. In.	Cir. In.	Area Sq. In.	Dia. In.	Cir. In.	Area Sq. In.	Dia. In.	Cir. In.	Area Sq. In.
1/16	.04909	.00010	1 1/2	5.3014	2.2365	4 1/2	13.941	15.436	8 1/2	25.918	53.456
1/8	.09818	.00077	1 3/4	5.4978	2.4053	4 3/4	14.137	15.904	8 3/4	26.311	55.088
3/16	.14726	.00173	1 5/8	5.6941	2.5802	4 5/8	14.334	16.349	8 5/8	26.704	56.745
1/4	.19635	.00307	1 7/8	5.8905	2.7612	4 7/8	14.530	16.800	8 7/8	27.090	58.426
5/16	.24542	.00690	2	6.0868	2.9483	4 9/8	14.726	17.257	9	27.489	60.132
3/8	.29450	.01227	2 1/8	6.2832	3.1416	4 11/8	14.923	17.728	9 1/8	27.882	61.862
1/2	.34358	.01917	2 3/8	6.4795	3.3410	4 13/8	15.119	18.190	9 3/8	28.274	63.617
5/8	.39266	.02761	2 5/8	6.6759	3.5466	4 15/8	15.315	18.665	9 5/8	28.667	65.397
3/4	.44174	.03758	2 7/8	6.8722	3.7583	4 17/8	15.512	19.147	9 7/8	29.060	67.201
7/8	.49082	.04909	3	7.0686	3.9761	4 19/8	15.708	19.635	10	29.452	69.029
1	.53990	.06213	3 1/8	7.2649	4.2000	4 21/8	15.904	20.129	10 1/8	29.845	70.882
1 1/16	.58898	.07670	3 3/8	7.4613	4.4301	4 23/8	16.101	20.629	10 3/8	30.238	72.760
1 1/8	.63806	.09281	3 5/8	7.6576	4.6684	4 25/8	16.297	21.135	10 5/8	30.631	74.662
1 3/8	.68714	.11045	3 7/8	7.8540	4.9087	4 27/8	16.493	21.648	10 7/8	31.023	76.589
1 1/2	.73622	.12962	3 9/8	8.0503	5.1572	4 29/8	16.690	22.166	11	31.416	78.540
1 3/4	.78530	.15033	3 11/8	8.2467	5.4119	4 31/8	16.886	22.691	11 1/8	31.809	80.516
1 5/8	.83438	.17267	3 13/8	8.4430	5.6727	4 33/8	17.082	23.221	11 3/8	32.201	82.516
1 7/8	.88346	.19635	3 15/8	8.6394	5.9396	4 35/8	17.279	23.758	11 5/8	32.594	84.541
2	.93254	.22166	3 17/8	8.8357	6.2126	4 37/8	17.475	24.301	11 7/8	32.987	86.590
2 1/16	.98162	.24860	3 19/8	9.0321	6.4918	4 39/8	17.671	24.850	12	33.379	88.664
2 1/8	.10365	.27688	3 21/8	9.2284	6.7771	4 41/8	17.868	25.406	12 1/8	33.772	90.763
2 3/8	.10873	.30680	3 23/8	9.4248	7.0686	4 43/8	18.064	25.967	12 3/8	34.165	92.886
2 1/2	.11381	.33824	3 25/8	9.6211	7.3662	4 45/8	18.261	26.535	12 5/8	34.558	95.033
2 5/8	.11889	.37122	3 27/8	9.8175	7.6699	4 47/8	18.457	27.109	12 7/8	34.950	97.205
2 3/4	.12397	.40574	3 29/8	10.014	7.9798	4 49/8	18.653	27.688	13	35.343	99.402
2 7/8	.12905	.44179	3 31/8	10.210	8.2958	4 51/8	18.850	28.274	13 1/8	35.736	101.62
3	.13413	.47937	3 33/8	10.407	8.6179	4 53/8	19.046	28.865	13 3/8	36.128	103.87
3 1/16	.13921	.51849	3 35/8	10.603	8.9462	4 55/8	19.242	29.465	13 5/8	36.521	106.14
3 1/8	.14429	.55914	3 37/8	10.799	9.2806	4 57/8	19.438	30.070	13 7/8	36.914	108.43
3 3/8	.14937	.60132	3 39/8	10.996	9.6211	4 59/8	20.028	31.191	14	37.306	110.75
3 1/2	.15445	.64504	3 41/8	11.192	9.9678	4 61/8	20.813	32.472	14 1/8	37.699	113.10
3 3/4	.15953	.69029	3 43/8	11.388	10.321	4 63/8	21.206	33.785	14 3/8	38.092	115.47
3 5/8	.16461	.73708	3 45/8	11.585	10.680	4 65/8	21.598	35.122	14 5/8	38.485	117.86
3 7/8	.16969	.7854	3 47/8	11.781	11.045	4 67/8	21.991	36.465	14 7/8	38.877	120.28
4	.17477	.83438	3 49/8	11.977	11.416	4 69/8	22.384	37.801	15	39.270	122.72
4 1/16	.17985	.88346	3 51/8	12.174	11.793	4 71/8	22.776	39.138	15 1/8	39.663	125.19
4 1/8	.18493	.93254	3 53/8	12.370	12.177	4 73/8	23.169	40.478	15 3/8	40.055	127.68
4 3/8	.19001	.98162	3 55/8	12.566	12.566	4 75/8	23.562	41.822	15 5/8	40.448	130.19
4 1/2	.19509	.10365	3 57/8	12.763	12.962	4 77/8	23.955	43.171	15 7/8	40.841	132.73
4 5/8	.19997	.10873	3 59/8	12.959	13.364	4 79/8	24.347	44.522	16	41.233	135.30
4 3/4	.20485	.11381	3 61/8	13.155	13.772	4 81/8	24.740	45.875	16 1/8	41.626	137.89
4 7/8	.20973	.11889	3 63/8	13.352	14.186	4 83/8	25.133	50.265	16 3/8	42.019	140.50
4 9/8	.21461	.12397	3 65/8	13.548	14.607	4 85/8	25.525	51.849	16 5/8	42.412	143.14
5	.21950	.12905	3 67/8	13.744	15.033						

ting. The high-tension cable from this cylinder should then be connected to the corresponding distributor termi-



THE FORMULAS EXPRESSED IN DIAGRAM

If the motor misses with the spark retarded (and misses more at low than at high speed), the contact screw should be screwed out, a notch at a time, until the missing is overcome. If the motor misses with the spark advanced (and more at high than at low), the contact screw should be screwed in, a notch at a time, until the missing is overcome. When current adjustment is once made, further attention should not become necessary for several months.

Magneto Lubrication

Each of the oilers of the magneto should be given a few drops of very light oil about every thousand miles. The cam should receive a little oil every three months.



insulation or loose terminals or for a place where the current is "grounded" by the wire making contact with some part of the car.

In turning the motor over you may open the priming cups to make the testing operation easier and to prevent the motor from starting suddenly.

(To be continued)

The Circumferences and Areas of Circles

The calculation of circumferences and areas is sometimes necessary both for the vehicle smith and the machine smith. And the automobile repairman will often find a table of circumferences and areas useful in calculating wheel circumferences and cylinder measurements. For example: such figures as piston displacement, the capacity of full tanks, gear ratios, must all be figured from the basis of circumference or area.



Photo by D. P. S.

IS THIS A FREAK OF NATURE OR IS THE CAMERA GUILTY OF NATURE FAKING

To find the circumference of a circle with its diameter given, multiply the diameter by 3.1416; and to find the area of a circle with the diameter given, multiply the square of the diameter by .7854.

In the accompanying table these dimensions have been figured out for circles varying in diameter from $\frac{1}{4}$ inch to $13\frac{1}{2}$ inches.

Circumferences and areas of circles up to 27 inches in diameter can be obtained from the table; though the latter shows circles up to $13\frac{1}{2}$ inches in diameter. For circles larger

than $13\frac{1}{2}$, divide the diameter by two and multiply the corresponding circumference by two and the corresponding area by four.

For example: suppose we require the circumference and areas of a circle 20 inches in diameter. Twenty divided by two gives us ten. According to the table we find that the circumference of a 10-inch circle is 31.416—the diameter of a 20-inch circle will therefore be twice 31.416 or 62.832; and as the area of a 10-inch circle is 78.540 the area of a 20-inch circle will be four times 78.540 or 314.160.

A Bow Socket Rivet Punch

A. L. LEWIS

This is a handy tool for punching out bow socket rivets. Without this tool it takes two men; but with this tool one man can easily do the work. The main bar, A, is made of buggy axle, 1 inch square and 11

your punch to work easily. The punch, G, is forged down at one end to $\frac{1}{4}$ inch. At the end, H, of the bar, A, countersink a hole large enough to fit the bow socket rivet head. When you put in a new rivet, place the end, H, against its head.



What Ails Business?

How many times have you asked yourself that question?

How many, many times have you questioned and quizzed—What ails business, anyway? How many times have you asked why, why, why? why don't I make more money? why is business poor? why are collections slow and why a hundred other things? And all summed up in the question, What Ails Business?

Yes—WHAT?

One smith says—I keep my accounts carefully, send out my bills regularly, but I cannot understand what ails business.

Another says—I buy carefully, sell carefully and yet cannot understand what ails business.

A third says—I advertise carefully, but what ails business?

And still another and others continue to ask, what ails business?

Is it poor business methods?

Is it poor help?

Is it poor bookkeeping?

Is it carelessness?

Is it bad buying?

Am I figuring profits wrong?

Am I overlooking the leaks?

Am I selling too low or too high?

Am I following wasteful methods?

Is there too much on the books?

Just what is it that ails business?

Most smiths can say: "I do a fair business."

And most of them can also say: "And yet I get but a bare living out of it."

Now—What Ails Business?

"I collect a good proportion of my accounts," says one Ohio smith, "and do a fair cash business—yet I cannot put what I should in the bank."

"I am busy from opening time to closing time," says another general shop-owner of New York State, "still I can't seem to get ahead of the game. I always feel as though I was chin deep in a pool whose surface rises every time I stop treading water."

And one and all ask—

What Ails Business?

NOTE—This is the fifth of a series of talks by the Editor on Business, Prices, Profits and Costs. The sixth and last talk "The Solution" will appear next month.



The Fellow Down the Street

I

We have our troubles every day—
If it isn't this, it's that;
At times for stock too much we pay,
And then too cheap sell at.
Then trade is often very slow,
Or when we have a rush
The price we get is far too low,
Tho' money may be flush.
And there's a reason for these same
Old evils we all meet:
There's just one chap that is to blame—
The fellow down the street.

II

The people in the neighborhood
Are mighty slow to pay;
They never settle as they should
For stuff they haul away.
They postpone, promise, "stand me off"
A week, a month, a year;
They never seem to want to "cough"
For work they get done here.
It keeps each chap that's in the game
Upon the anxious seat,
But then there's just one chap to blame—
The fellow down the street.

V

But then perhaps he thinks of me
The same as I of him;
Or maybe he'd be glad to see
Me,—shake and say: "Lo, Jim!"
Maybe he's not as black as I
Do sometimes think he is,
And maybe these here gossips lie
In telling things of his.
But, anyway, you must agree,
It's best that we should meet—
I'm going down right now to see
The fellow down the street.

III

There's someone cutting prices here
And saying ugly things;
Most every business day I hear
Some of his sassy flings.
The things he says of me, they tell
Me—tho' it makes me blue,
I know the chap just lies like—well,
I simply say: "'Tain't true."
I know it's just an awful shame—
Such luck is hard to beat,
But then there's just one chap to blame—
The fellow down the street.

IV

Why can't this chap be more like me
And "cut the knocking out,"—
If he a gentleman would be
I'm sure there is no doubt
That little work would go at cost,
Nor would I have a grudge,
Nor would my profits all be lost
Nor would I be a drudge.
I've often thought of what I'd say
To him if we should meet—
But somehow, he don't come my way—
This fellow down the street.



That new leaf still turned?

Is it best to govern your business with positive knowledge or with guess?

Mere hard work will not bring success. You can't make a success of your business unless you *work intelligently*.

Nine tenths of all smithshop owners are making less than they think they are; and they are always surprised to find it out.

There's danger of the trade getting beyond your reach if you don't keep in touch with it. A good craft journal keeps you posted.

No easier way, when you know a man needs something in your line, than to write and tell him so.

Some smiths are so afraid of organization and co-operation that they see nothing but the harm in harmony.

Are you getting your share of the implement work in your neighborhood? The plow share is your share.

Now is none too early to get your lines out for spring work. There'll be a rush when spring opens. Do some of the rush work now.

What do you pay yourself? You should receive a salary; and you are worth more than any one of your men. See that you get more.

Run over your accounts occasionally or they will overrun. Keep right at the slow payers. You can't do business on the money outstanding—get it in!

Economy is not so much the saving of money as it is the saving of what you buy with the money you spend. Just apply that to a modern shop equipment.

When you employ a plumber, carpenter, or mason by the hour can you pay them with the money you earn by the hour? It's pretty near time to raise prices, isn't it?

If you had a barrel of paint or oil in the stockroom and it was leaking, when would you want to know about it, the first day or at the end of the year?

A good opening is said to be awaiting a good general smith at Fellsmere, Florida. Address The Fellsmere Farms Co. for full particulars.

Are you putting something aside for a rainy day? No matter how much—put a little aside at regular intervals. It will surprise you how soon a little means a lot.

A business smith may fool himself by failing to charge all of his expenses into his cost of doing business, but his expenses will come out of his gross profits just the same.

A good wheel will grind in water, soda water or oil. Water keeps the wheel cool and increasing grinding. Soda water keeps

the machine and work from rusting. Oil in soda water increases the wheel's effectiveness.

There was a slow smith in Chicago, Who dropped a hot shoe on his big toe; The shoe jarred him so That he ceased to be slow— Now he's half way finished 'fore you say "go."

Good shop pictures are always wanted. The shop number of 1913 is now being planned, and pictures of shop interiors and exteriors; floor plans and shop descriptions are wanted. Don't wait—send in your material now. We want it.

A successful business transaction is that in which both seller and buyer profit. When your customer is the only one to profit it is time to get out of business. Are you in business for your own or your customer's profits?

Oh! yes, Tom's shop stove is up and a fire in it, too. Of course he hasn't yet gotten any stovepipe, and the shop is filled with thick, choking smoke—but as Tom says: "It keeps me warm, an' some day when I've got time I'll get a piece of pipe. Hardly worth while, tho'—it rusts out so fast."

Just consider this seriously, silently, intently: If a man will read carefully all the obtainable literature on his particular trade—and after reading will review, consider and study those items warranting it—can he prevent himself from becoming a better man, a better worker, a better citizen?

Don't forget the business resolutions you made about January first. What! Didn't make any! Better do so now. Here:

RESOLVED:—That I will know more about my business during 1913. That I will know costs, profits and selling price. That I will know my stock, my trade, my customers more intimately. That I will study the needs and the possibilities of my business. That a bigger success in every way will follow in as sure as day follows night.

Here's how a Pennsylvania hardware man announced a change in business policy:

Announcement

Faith, Hope and Charity, the Good Book tells us, are the cardinal virtues. For some time past we have done business pretty much on *Faith*, and while we have not lost *Hope*, we fear that our present course may get us on speaking terms with *Charity*.

This, then, is to say that on and after October first this store will be run on

A Strictly Cash Basis.

We have lost none of our love for the American people; this is purely a business proposition; absolutely impersonal; actuated by a desire to give our patrons lower prices and ourselves more money in the drawer and less on the books.

"Pay as you go" we believe is the better way, the safer way, especially in these strenuous times when we treat the dollar lightly, and thrift has become a forgotten virtue.

Everybody knows that a certain percentage of charge accounts eventually go to profit and loss—who pays this margin of loss? The honest man, of course.

Most of my trade will rejoice at this change and be glad to avail themselves of this re-pricing—from TWO TO TEN PER CENT REDUCTION practically all along the line.

Your every need in our line can be supplied here, and, remember, AT CASH prices.



Our Honor Roll

Beyond January, 1916

To get on Our Honor Roll your account must now be paid to beyond January, 1916. You see, every month there are more and more of "Our Folks" in line for the Honor Roll. Last month there were forty new names added—this month, fifty-five.

HERE'S HOW to get into line and to save money: If your account expires this month of February, 1913, send \$5.00 (\$7.00 in Canada, 1£14 s. in other countries) and receive ten years' credit, making your account paid up to February, 1923 and you save just \$5.00 (or \$5.50 in Canada, 1£6 s. in other countries). Or suppose you send \$3.00 (\$3.75 in Canada, 1£ in other countries)—that will pay your account up to February, 1918, and you will save \$2.00 (or \$2.00 in Canada, 10s. in other countries). Isn't that saving worth while? And think of the time, trouble and annoyance you save yourself by remitting for a term of years.

If you don't know the condition of your subscription account, better ask the subscription department. They will gladly tell you and give you any information you want on our long-time rates.

Get into the 1923 class now before it gets crowded. Send in a ten-year order and save five dollars. You know a dollar saved is a dollar earned and you cannot earn five dollars easier or quicker, to say nothing of the good practical help you will get out of the paper.

	U. S. and Mexico	Canada	Other Countries
Two years.....	\$1.60	\$2.00	10 shillings
Three years.....	2.00	2.70	14 shillings
Four years.....	2.50	3.20	18 shillings
Five years.....	3.00	3.75	1 pound
Ten years.....	5.00	7.00	1 pound 14s.

You can also gain a place on Our Honor Roll by getting new subscribers. Show this big list to your brother craftsmen. A paper must be pretty good to get a practical man's subscription years and years in advance. Send in the new subscriptions and we will give you six months' credit on your account for each new order. Will you tell your neighbor?

NAME	Subscription Paid to
W. C. WATT, Kan.	Dec., 1930
I. J. STITES, N. J.	Jan., 1928
W. R. TURNER, Man.	Oct., 1923
T. BRADLEY, N. S. Wales	Mar., 1923
G. C. DISINGER, Miss.	Feb., 1923
Z. A. ENOS, Kan.	Jan., 1923
W. G. WISE, Cal.	Jan., 1923
S. P. HARNET, Mont.	Dec., 1922
W. BRECKNER, Okla.	Dec., 1922
L. O. LEURS, Ill.	Nov., 1922
W. LAWSON, N. Z.	Nov., 1922
O. A. MORTIMORE, Idaho	Sept., 1922
H. J. WYATT, Wash.	Sept., 1922
J. N. SKOW, Ia.	Sept., 1922
A. D. STANDIFORD, Wash.	Sept., 1922
T. TINKLEWIS, Que.	Sept., 1922
A. PFYFFER, Ohio	Aug., 1922
J. ERMAN, Ark.	July, 1922
W. K. W. HANSEN, Pa.	June, 1922
ROBERT TOCHTER, Cal.	June, 1922
J. VAN MARTER, N. Y.	June, 1922
E. ANDERS & SON, S. Aus.	May, 1922
LOUISA CARRIAGE WKS., Va.	May, 1922
S. SMITH, Tex.	Apr., 1922
J. W. HAAR, La.	Mar., 1922
E. A. DILLON, Nev.	Mar., 1922
D. W. SMITH, R. I.	Mar., 1922
D. F. KUSTER, Wash.	Mar., 1922
R. H. KEITE, Ia.	Jan., 1922
O. M. JOHNSON, Minn.	Oct., 1921
H. FELDUS, Neb.	Sept., 1921
W. K. KLINE, Kan.	May, 1921
T. P. CONSIDINE, Mass.	Dec., 1920
ED. GRIMM, Tex.	Mar., 1920
R. S. CRISLER, Ky.	Jan., 1920
I. M. TOWNSEND, Cal.	Apr., 1919
C. WILLIAMS, W. Aus.	Mar., 1919
A. B. WENDLANDT, Wash.	Sept., 1918
A. J. BROOKMAN & Co., Vic.	Sept., 1918
PETER COCKS, W. Aus.	Sept., 1918
R. J. TOMPKINS, Tex.	Sept., 1918
A. DISCHER, Aus.	Aug., 1918
WRIGHT & SON, Tex.	June, 1918
ALBERT MILLUM, N. D.	June, 1918
H. L. HASWELL, N. C.	May, 1918
R. COLVIN, Ind.	Apr., 1918
D. C. HOUCK, Ohio	Mar., 1918
RENTON WAGON WKS., Wash.	Feb., 1918
WHITING Fdy. EQUIP. Co. Ill.	Feb., 1918
J. P. KOENIGS, S. Dak.	Feb., 1918

NAME	Subscription Paid to
RICHARD BRENNER, Tex.	Feb., 1918
W. F. HILL, N. C.	Feb., 1918
D. C. FOLEY, Cal.	Jan., 1918
GLEASON BROS., La.	Jan., 1918
C. E. KRUG, Wis.	Jan., 1918
G. E. WOODARD, Kan.	Jan., 1918
P. J. DALLY, W. Aus.	Jan., 1918
J. MORROW, Pa.	Jan., 1918
J. G. JOHNSON, Ill.	Dec., 1917
F. E. EGLERS, Ohio	Dec., 1917
C. T. FORREST, Cal.	Dec., 1917
THEO. BUSH, N. Y.	Dec., 1917
J. T. ELLIOTT, Ill.	Dec., 1917
J. VOELPEL, Ill.	Dec., 1917
W. J. MAIN, Cal.	Dec., 1917
G. J. SAUER, Mo.	Dec., 1917
MESS BROS., Vict.	Dec., 1917
KATE & AINLEY, Eng.	Nov., 1917
T. H. ZIEGLER, Wis.	Nov., 1917
SCHOLLER BROS., Ind.	Nov., 1917
E. M. WURSTER, Mich.	Nov., 1917
S. Z. FREY, Ind.	Nov., 1917
B. A. STEINKE, Ohio	Nov., 1917
J. N. BATHGATE, N. Dak.	Nov., 1917
GEO. POTSCHKE, Mo.	Oct., 1917
J. W. RAPS, N. Y.	Oct., 1917
W. C. RONEY, Pa.	Oct., 1917
J. N. MILES, Ky.	Oct., 1917
W. A. WILSON, N. Z.	Sept., 1917
R. ROSS, N. S. Wales	Sept., 1917
I. E. SPROUD, Me.	Sept., 1917
C. L. HOCKETT, Cal.	Aug., 1917
H. C. STENZEL, Tex.	Aug., 1917
M. DELJAGER, S. Africa	Aug., 1917
F. HOWARD, Kan.	Aug., 1917
H. FERREL, Ill.	Aug., 1917
J. MCMEEREN, N. Z.	Aug., 1917
F. H. GIERKE, S. Aus.	Aug., 1917
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H. J. DEVONSHIRE, N. Z.	July, 1917
V. J. HUBBARD, N. Y.	July, 1917
W. R. GELLING, S. Africa	June, 1917
J. H. BAKERBERG, S. Africa	June, 1917
G. R. HALLENBECK, N. Y.	June, 1917
F. C. BOCK, Neb.	June, 1917
YOST & HALVORSON, Minn.	May, 1917
W. MCCOY, Kan.	May, 1917
A. GUNTTLER, Tex.	May, 1917
C. F. J. LORENZ, N. Y.	May, 1917
A. DATWYLER, Ohio	May, 1917
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J. M. BROWN, Tex.	Apr., 1917
J. C. WOODS, W. Aus.	Mar., 1917
C. BOULTON, N. S. Wales	Mar., 1917
C. A. HAWKINS, Ore.	Mar., 1917
A. L. MONTGOMERY, W. Va.	Mar., 1917
J. PETERSON, Ia.	Mar., 1917
J. ANDERSON, Tas.	Mar., 1917
J. J. NEILL, Vt.	Mar., 1917
ED. DETTRICH, Ind.	Mar., 1917
LEWIS CHASE, N. Y.	Mar., 1917
E. O. LEE, S. Dak.	Mar., 1917
S. STEPHENS, Ohio	Mar., 1917
R. S. GUGLIEMMO, Kan.	Mar., 1917
J. S. HASKELL, Cal.	Mar., 1917
W. L. ROARK, Tex.	Mar., 1917
A. R. BARLOW, Tex.	Mar., 1917
C. A. WHITAKER, Ohio	Mar., 1917
B. P. CANNY, Ill.	Mar., 1917
F. MARSH, Mich.	Feb., 1917
J. H. WHITE, N. H.	Feb., 1917
MCGOWAN BROS., N. Y.	Feb., 1917
W. H. SCHENK, Neb.	Feb., 1917
A. J. H. WEGENER, S. Africa	Feb., 1917
H. SCHWITZ, Ill.	Feb., 1917
E. DOUGHERMAN, Ohio	Feb., 1917
J. W. HAUGHT, Ill.	Feb., 1917
CHAS. F. GIESSE, N. Mex.	Feb., 1917
M. E. GOLLER, Pa.	Feb., 1917
J. POTTSOFF, Neb.	Feb., 1917
G. M. GARETT, Mich.	Feb., 1917
ERNEST FINLEY, Pa.	Feb., 1917
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G. W. WHITTINGTON, W. Va.	Feb., 1917
J. H. HOYLE, S. Africa	Feb., 1917
IRVING BROS., N. Y.	Feb., 1917
F. ROSCHY, Pa.	Feb., 1917
AUGUST MILLER, Ill.	Feb., 1917
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S. HETEM, S. Africa	Jan., 1917
G. A. GURLEY, Ore.	Jan., 1917
F. K. WADE, Me.	Jan., 1917
L. V. SENN, Neb.	Jan., 1917
S. H. AUSTIN, N. Y.	Jan., 1917
H. KARL, Ia.	Jan., 1917
J. H. BERGEN, Kan.	Jan., 1917
F. G. A. WILLIAMS, S. Aus.	Jan., 1917
J. B. SCHEIDLER, Ind.	Dec., 1916
F. KUMMER, Ohio	Dec., 1916
ALFRED CASE, N. Z.	Dec., 1916
H. GRIMM, Utah	Dec., 1916
A. H. GOODING, S. Aus.	Dec., 1916
LEONARD SMITH, N. J.	Dec., 1916
C. F. SHAW, Man.	Dec., 1916
W. EDWARD, Pa.	Dec., 1916
W. W. EGLY, Pa.	Dec., 1916
JOS. BOTER, Mich.	Dec., 1916
J. WILLIAMS, N. S. Wales	Dec., 1916
J. H. W. SCHNEIDER, Cal.	Dec., 1916
W. SAUER, Minn.	Dec., 1916
F. F. DARLING, Cal.	Dec., 1916
CHAS. NEWLAND, Cal.	Dec., 1916
P. T. BRAEM, Ia.	Dec., 1916
H. ST. LOUIS, Wis.	Dec., 1916
A. E. NICKOLS, Okla.	Dec., 1916
C. J. HALL, Wash.	Dec., 1916
BOB FRICKER, Ala.	Dec., 1916
JORRIS BROS., Tex.	Dec., 1916
R. CLEMENS, Conn.	Dec., 1916
SCHIEFFEL & SCHMITT, Pa.	Dec., 1916
A. BRAUSE, Ohio	Dec., 1916
J. E. BEATTY, Mo.	Dec., 1916
GEO. CASSIE, Scotland	Dec., 1916
JOHN KAIN, Ky.	Dec., 1916
F. W. HOWELL, Ill.	Dec., 1916
W. B. TAYLOR & SON, Mo.	Nov., 1916
G. WHITTEN, Mass.	Nov., 1916
J. M. VINCENDA, Wis.	Nov., 1916
TOM NOLAN, S. Aus.	Nov., 1916
H. J. FRANCE, N. Z.	Nov., 1916
F. N. BROWNING & SON, Ky.	Nov., 1916
J. MACUAB, Scotland	Nov., 1916
P. GESSEN, Ill.	Nov., 1916
J. W. GRIBBLE, S. Aus.	Nov., 1916
W. G. SIM, N. Z.	Nov., 1916
H. V. RUEHL, Ala.	Nov., 1916
G. LINDBORG, Ind.	Nov., 1916
PITTMAN STELL, N. C.	Nov., 1916
J. S. FINKENBERGER, Ind.	Nov., 1916
R. D. WILSON, N. Y.	Nov., 1916
C. W. SCHMIDT, Cal.	Oct., 1916
T. J. MAGUIRE, N. Y.	Oct., 1916
A. W. WAITE, Cal.	Oct., 1916
C. W. ELLIS, Tex.	Oct., 1916
J. P. SIMEON, N. S. Wales	Oct., 1916
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T. J. HASKINS, N. S. W.	Oct., 1916
LOTHIAN & SKINNER, N. S. W.	Oct., 1916
W. B. KNOFF, Ala.	Oct., 1916
GORHAM BROS., Ia.	Oct., 1916
W. H. F. BRUCE, N. C.	Oct., 1916
CLARK OLDS & CO., Neb.	Oct., 1916
IRWIN SCOTT, N. Y.	Oct., 1916
C. E. DURHAM, Kan.	Oct., 1916
M. RINGO, S. Africa	Oct., 1916
W. DELLEY, Queens, Aus.	Oct., 1916
S. B. PHILLIPS, W. Va.	Sept., 1916
G. E. HARPER, Texas	Sept., 1916
J. J. ILLER, N. S. Wales	Sept., 1916
JAMES PORTOGEN & Co., Mo.	Sept., 1916
JNO. GOETTINGER, Ia.	Sept., 1916
GEO. FLECKENSTEIN, Cal.	Sept., 1916

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GEO. HILL, Aus.	Sept., 1916
E. C. BEARD, Aus.	Sept., 1916
J. K. GLINICKI, Mich.	Sept., 1916
OSCAR BURNER, Md.	Sept., 1916
A. J. HAMMOND, Cal.	Sept., 1916
ROBERT MURRAY, Cal.	Sept., 1916
D. E. WRIGHT, Cal.	Sept., 1916
J. S. HASKELL, Cal.	Sept., 1916
R. SOMMER, Aus.	Sept., 1916
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DISPATCH Fdy. LTD., N. Z.	Aug., 1916
ERNEST E. DOTT, Ohio	July, 1916
F. C. ASHTON, Pa.	July, 1916
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A. A. BARKER, Mich.	July, 1916
J. K. HANSEN, Aus.	July, 1916
J. B. BARKER, Ill.	July, 1916
H. M. LARSEN, Wis.	July, 1916
GEO. P. MACINTYRE, Mo.	July, 1916
JAS. A. BUCHNER, Mich.	July, 1916
L. H. FINGAR, N. Y.	July, 1916
L. H. STRANGE, Vict.	July, 1916
P. O'DONNELL, Vict.	July, 1916
R. J. HANCOCK, N. Z.	July, 1916
F. G. WILSON, Calif.	July, 1916
I. H. HALL, Ind.	June, 1916
F. FUJITO, N. S.	June, 1916
J. CHALMERS, S. Africa	June, 1916
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J. VOICICH, S. Africa	June, 1916
W. VOICICH, S. Africa	June, 1916
MARTIN JENSEN, Wis.	June, 1916
CHESTER HUMBERT, Wis.	June, 1916
LINCOLN UNDERHILL, Cal.	June, 1916
M. BROTON, N. Dak.	June, 1916
HANS ERIKSEN, Ill.	June, 1916
C. MORRELL, N. Brunswick	June, 1916
J. O. CONRAD, Kan.	June, 1916
ADAM SCHMITT, Mich.	June, 1916
J. G. REEVES, S. Aus.	May, 1916
I. H. LUNDE, N. Dakota	May, 1916
JAMES SINCLAIR, W. Aus.	May, 1916
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C. H. CAIRNS, N. Y.	May, 1916
P. V. JOHNSON, Ohio	May, 1916
F. E. SMITH, Vt.	May, 1916
C. A. STEBBINS, Kan.	May, 1916
SANFORD BAKER, Mo.	May, 1916
E. B. ANDERBERG, Ill.	May, 1916
WELSH BROS., Ind.	Apr., 1916
KELLNER BROS., W. Aus.	Apr., 1916
P. A. PETERSON, Ia.	Apr., 1916
G. F. BOWERS, Okla.	Apr., 1916
D. E. McDONALD, Fla.	Apr., 1916
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W. E. HART, Okla.	Mar., 1916
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FRANK L. LOCKE, N. Y.	Mar., 1916
FRANK L. EVARTS, Conn.	Mar., 1916
C. R. WINGET, Vt.	Mar., 1916
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C. F. MCKENTEN, Aus.	Mar., 1916
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A. A. SCHREIBER, Tex.	Feb., 1916
J. T. DILLARD, Tex.	Feb., 1916
F. J. FLESSER, N. Y.	Feb., 1916
E. P. JONES, Kan.	Feb., 1916
E. J. BISHOP, N. Y.	Feb., 1916
J. N. TYLER, Ohio	Feb., 1916
T. BROWN, Conn.	Jan., 1916
W. SMITH, Penn.	Jan., 1916
J. S. RUSE, Ohio	Jan., 1916
E. W. MARTIN, Cal.	Jan., 1916
N. T. HOWARD Mo.	Jan., 1916
H. L. WOLF, Pa.	Jan., 1916
H. KREITZER, Pa.	Jan., 1916
A. MOSHER & SON, N. Y.	Jan., 1916
F. HARLOW, Mass.	Jan., 1916
C. M. HANUM, Conn.	Jan., 1916
PETER COX, W. Aus.	Jan., 1916
CHAS. H. KERN, Ill.	Jan., 1916
J. H. ECROYD, Cal.	Jan., 1916
THOMAS HORNE, Ariz.	Jan., 1916
CHARLES TUCKER, Mich.	Jan., 1916
M. KLITGORD, N. Y.	Jan., 1916
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IVER JOHNSON ARMS AND	Jan., 1916
CYCLE WORKS, Mass.	Jan., 1916
FELDMAYER & SCHAAKE,	Jan., 1916
Kan.	Jan., 1916



Ten Questions for the Month

The questions this month are on wood working and wood-working tools. We believe the wood worker will get several ideas in these questions that will lead him into a more serious study of his art. Some folks seem to think "there's nothing much to wood working," but nevertheless it is an art, just the same, and the man who desires to become a successful wood worker must be an artist. The answers to these questions will appear next month.

1. Describe the shapes and uses of the paring chisel, the mortising chisel and the coach maker's chisel.

2. What are the uses of the try plane and the jack plane?

3. How is the fineness or coarseness of a saw indicated? Give an example.

4. What degree of fineness is best in a crosscut saw for ordinary work? For very fine or very heavy hardwood?

5. When glueing two wooden surfaces together why is it best to warm the surfaces to be joined before applying the glue?

6. When using wooden wedges for any purpose should hardwood or softwood wedges be used? Why?

7. How may the bottoms of wood planes be kept in good condition?

8. When using a paring chisel, should it be forced straight through the wood?

9. Give a simple method of making a waterproof glued joint.

10. Give a simple formula for making putty.

Answers to Questions in January Issue

1. The horse's foot is a living, growing thing; filled with blood-vessels, live tissues and nerves. To properly care for it the shoer must know its construction. To intelligently fit, pare and nail a shoe, and to fit a hoof with the proper shoe and to know why certain things are done and why they accomplish certain results is impossible without a knowledge of anatomy.

2. Canon bone, long pastern, sesamoid bones, short pastern, navicular bone and foot bone.

3. The hoof is a very thick skin that protects the horse's foot. It is

a hard, tough, box-like structure made up of horn-like material, and carries in it the living tissues of the foot.

4. The pododerm.

5. The wall, the sole and the frog.

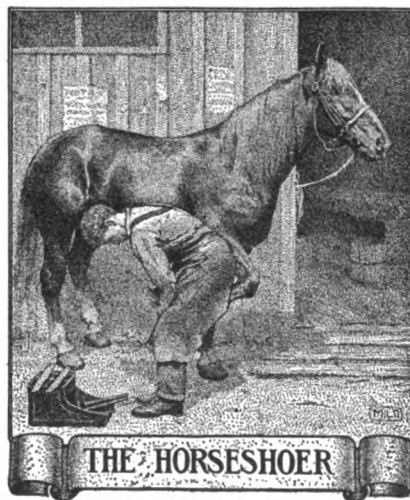
6. No. The front hoof is thickest at the toe and becomes gradually thinner toward the quarters. In hind hoofs the thickness of the wall varies little from toe to quarters.

7. The "white line" is the juncture of the horny wall and the sole. It is formed by horn leaves which are secreted by the fleshy leaves that make up that part of the foot structure immediately beneath the horny box. The white line is soft and is important, because by it is judged the thickness of the hoof wall and into it should be driven the nails that hold the shoe.

8. The frog is naturally wedge-shaped and quite soft and elastic.

9. So that proper steps may be taken in correcting any defects in action, by properly paring the feet and using such shoes as experience and the science of shoeing have determined are best suited for the purpose.

10. By the use of the bar shoe pressure is placed on the frog, and thus it restores the normal activities of the foot. It gives the foot a larger bearing surface and, when necessary, relieves diseased portions of the foot from pressure.



Cross-Firing and Knee-Striking—2

LESTER W. SIMS

Having explained in my previous article that the pacing horse when he interferes virtually does but two

things—he either cross-fires or knee-bangs. After having made plain the manner of how he does these things, naturally next in order is why he does cross-fire and knee-bang. By going deeper and more thoroughly into the subject I trust it will prove interesting as well as instructive.

Causes and Effects

The causes are many:—will say first that improper shoeing and unbalanced feet while the most common causes are not always or entirely to be found at fault. As a preventive measure, the first is precaution; for the horse may be pulling (lugging) on the reins or overcheck so hard as to unbalance his gait; this doubling him up and not allowing him to get out on a natural stride. All such cases are due to a bad mouth or improper biting, perhaps both. Always the first to be looked after is the mouth;—teeth may need dressing (floating), may be an ulcerated or elongated tooth, etc., all of which will cause lugging or pulling either on both reins or on one rein (side reining) or on the overcheck. To put the mouth in proper condition, try the following: (this is a valuable trick not generally known to professionals). The four front molars, two above and two below, should be dressed to slant back and be well rounded off so as to relieve bit pressure on the corners of these molars. Pressure affects the tooth nerves, causing the horse to grab the bit between the teeth, thus becoming a rank lugger. As a rule, bits should fit the mouth well and in every respect be comfortable. They should not pinch the mouth corner so as to bruise or make it sore. Bruising will eventually cause a callous, and the mouth then becomes insensible to the bit; causing the horse to lug. However, there are many different kinds of bits to suit the different mouths of horses and their dispositions. It is quite a problem within itself to get a horse's mouth and head rigged right (to say nothing about the driver's head). I hope that our readers can appreciate the value and realize the importance of the above facts.

Turning our attention to shoeing: The first thing to be said is that of neglecting to get the animal shod at the proper time or at irregular intervals, but allowing the feet to grow



out of shape and the shoes to wear out of shape. When this is the cause it is only necessary to properly dress and balance the feet, to fit the shoes neatly (with the head rigged right), to cure such a case of cross-firing and knee-banging.

The size and shape of track may be a cause. For instance; No. 1 is a straightaway course; No. 2, a mile regulation track; No. 3, a half-mile regulation track. Now, take three pacers equal in speed. In going the straight course all three go clear-gaited—no conflicting. On the mile regulation track, Horse No. 1 may cross-fire and knee-bang. On the half-mile track, Horses No. 1 and No. 2 may both cross-fire and knee-bang; while No. 1 may hit harder than on a mile track. No. 3 may be going clear-gaited, but he, too, can be confined to circles or turns so short as to cause his feet to conflict. The reason for this lies in the fact that, in going the turns, the pacer is compelled to go in what is known or termed a "propping" position. The two limbs on each side (especially the two inside ones) are continually dropping into the line of the two passing them—thus the animal cross-fires and knee-bangs.

Another question for consideration is the kind of footing the pacers

or sore ones like the soft track best). However, they all have their own peculiar gait and a particular fancy for a certain kind of footing and track, just as they have for shoes. I will drop a hint here that horses wearing special shoes usually prefer the firm footing, because special shoes lose, to an extent, their effect on soft, loose footing; and if the footing is very loose and deep the effect is entirely lost. This reminds of a saying among horsemen that a special track must be carried along to suit certain horses or the horses must be carried along until a track is found that suits the horse. This is very often the case, in order to get many horses to race successfully. Some that are star performers on the "parlor-kept" or "billiard-table" mile tracks couldn't beat a fat man around a poor half-mile track. Others can race fast and go clear-gaited over any old kind of "cow path".

The moral is this: It is one safe bet to get your checks down on one of those natural-born, good-gaited, clean-going ones. In my next article I will illustrate the methods to be used in shoeing and what can be accomplished with scientific horse-shoeing.

NOTE:—This is Mr. Sim's second article

Shoeing Horses for Winter Road and Ice Racing

DR. JACK SEITER*



Being in the midst of winter, an article on the shoeing of speed horses for work on the ice or snow paths will probably not be amiss.

The main object in view when doing this class of work is of course to furnish the animal with a good, safe and

secure foothold, and thus to prevent slipping. This in itself is a very simple matter, irrespective of the style or class of shoe we may employ, be it an ordinary chisel-calked shoe, a side-calked shoe, a Canadian ice-racing shoe, a neverslip or any of the numerous adjustable calk shoes.

All of the above named styles and patterns of shoes have their special virtues, also good and bad points. But they also have their faults and disadvantages, mostly governed, of course, by the class of work that is required of them, their liability of getting caught, in various ways, and pulled off, the height of the sharp calk raising the foot too far from the ground, and the liability of serious injuries, through, either calking, while at rest, or injury to the quarters or tendons while at speed.

Consequently, when we shoe one of this kind we must generally have two objects in view; namely, to prevent slipping and at the same time reasonable safety to the animal that is to wear the shoe.

For the use of horses that are owned in cities where the streets are paved and which at times are devoid of either snow or ice the use of the adjustable calk is recommended,

*Dr. Jack Seiter learned the art of shoeing under Frank Hanson, the best trotting horse-shoer of the country. He ran a shop for years at Washington Park Race Track and then "tented" on both the Illinois Valley Circuit and the Great Western Circuit. He has also made two trips down the Grand Circuit with Mr. Ed. Geers and his stable of "Cracks". He is a graduate of Chicago Veterinary College. During his travels, Dr. Seiter has shod horses for most of the great trainers and drivers of the past twenty years. He has worked on the feet of over 450 animals with records of 2.10 or better; among them being Dan Patch, 1.55; Minor Heir, 1.58 and Major Delmar, 1.59½. For the past year Dr. Seiter has had charge of the shoeing department of the International Horse Farm.



Underwood & Underwood, N. Y.

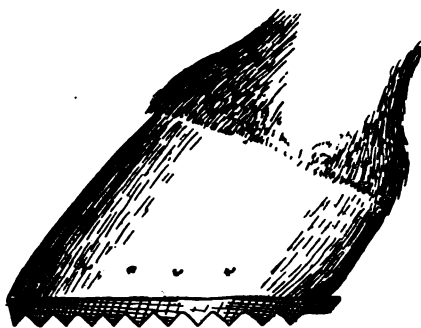
SERVIAN ARMY BLACKSMITHS SHOEING AN OX FOR TRANSPORTATION SERVICE OVER THE ROUGH MOUNTAIN ROADS

travel over. The greater majority will go faster over a solid or firm, smooth track (only rare exceptions

on the cross-firing and knee-knocking of the pacer. Mr. Sim's next article will tell how to correct these errors in gait, by shoeing and by other corrective measures.



as a trip over the hard, and bare pavements in order to get to the ice path is very apt to take the sharp edge off of most any type of sharpened calk. The various styles of adjustable



RUSSIAN ICE SHOE AS IT APPEARS
ON THE FOOT

calks can, however, readily be removed and replaced with new or sharp calks on arrival at the scene of racing.

On the other hand, if we were to employ the old style hand-sharpened make of toe and heel calks, we would have to remove the shoes every few days in order to have them resharpened, and this would eventually play havoc with the hoof, even if we did use the same nailholes several times. In order to retain the shoe firmly in its place we must, naturally, after several re-settings, use a larger size of nail to fill up the holes in both the shoe and foot, nails that are out of proportion to the size of the hoof, consequently, the hoofs are soon shattered and full of nailholes. This combined with the action of the snow and ice water on the horn soon ruins the best of feet in a very short time. Then we find it difficult to keep the shoe on the hoof; it is probably thrown off a few times and, naturally, the horn breaks off as a rule at the nailholes. So, for this class of shoeing, the adjustable calk certainly has the call.

For racing on the lakes or rivers of the far north, where regular ice-racing circuits are maintained, the ordinary chisel-calked shoes are preferred, for the reason that it gives the firmest kind of footholds. It is impossible for the animal to slip, and as they do not come in contact with the pavements it is not necessary to remove the shoes to be sharpened for weeks at a time and oftentimes they can be sharpened up with a file while on the foot.

Here the regular Canadian or Russian ice-racing shoes are also of practical use; the only objection to

them being the labor required in making a set of them and our inability to re-sharpen them very often.

Some drivers prefer rubber pads with two adjustable calks in the toe or else an ordinary hand-sharpened toe calk. This, to my notion, is a good combination for the city road horse or for the animal that is inclined to become sore-footed. In fact when a job of this kind is completed it makes an ideal form of shoeing; but the sole objection to this style of foot gear is met when the pad becomes worn at the heel and then we are requested to reset it and apply a new toe-calk. This invariably raises the toe too much for the amount of rubber in the heel of the pad, and the result is that we have a strain upon the tendons and ligaments and, consequently, lame animals.

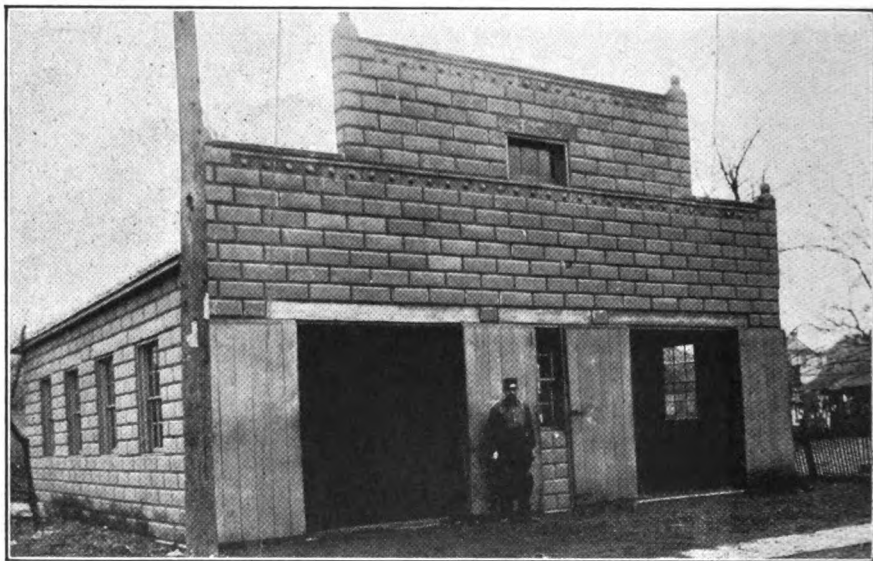
There are several ice-racing clubs in the vicinity of St. Paul and Minneapolis, and they use, without exception, the adjustable style of calks, and although occasionally there is some new style of foot gear introduced they invariably fall back to the neverslip pattern again.

We have tried and are now using on one of our mares that is racing in a series of ice races a new style of shoe; it is said to be the invention of

This shoe, a beautiful piece of work (it probably took a couple of Russians the greater part of a day to make and finish it), is similar to our B. & M. or rim-steel shoe; the entire rim being notched to resemble a saw blade; there being anywhere from thirty to forty teeth in each shoe, depending, of course, upon the size of the foot or shoe.

The advantages of this shoe being that the calks or, rather, teeth are not as long as any other style of calk, but the secure footing is derived from the number of them. (In union there is strength.)

This mare that I have referred to, simply could not pace on the ice path when shod with either the chisel or adjustable calked shoes that are necessary to furnish the needed hold and to prevent the ice from chipping out from under her feet. It seemed that she could not pull them out of the ice. She rolled and stumbled and then would go to a break,—something she never did on the dirt,—consequently she was of no use as an ice-racing tool. So after about four hours of hard work, which consisted mostly of filing, I had a set of four bar shoes made for her; bars in front to keep the pad and packing in place, and bars behind to keep the light shoe from spreading.



THE CONCRETE SHOP OF A. ELLSPERMAN & SON OF ILLINOIS

a Russian horseshoer. One of these shoes was presented to me by the former caretaker of Dan Patch, Chas. Plummer. He was one of the party that accompanied Mr. Billings' horses on their trip to the old country last year.

After I got her fixed up with the new fangled Russian shoes I had the satisfaction of seeing her an entirely different-gaited mare; she fairly flew over the ice with ease.

The objections to this shoe, outside of the labor connected with



making it, is the fact that it cannot be resharpened, consequently it is of no use, practically speaking, unless there is plenty of snow and ice, as one trip over a bare pavement would ruin it. And, again, unless an animal is perfectly gaited there is the greatest danger of cutting a quarter or severing a tendon.

I believe it is a good idea to dress the feet of animals used for this purpose as low as they will naturally go, as the calks necessarily raise the foot off the ground too far as it is. Use leather pads and packing under the shoes; it takes off the jar and has a tendency to lessen the liability of the foot being balled up with snow, which in itself oftentimes makes an animal go sore from excessive sole pressure.

The Horse's Foot

ED. HANNAN, V. M. D.
(Horse World)

"No foot, no hoss," is an old saying, but none the less true, and no matter how perfect in conformation or health the rest of the animal be, without good feet to carry the enormous weight falling upon them the value of the animal is greatly reduced. The foot requires as much attention, if not more, than any other part of the animal, although rarely is the deserved amount of attention given it, and because of this neglect we find more than half of the lameness with which the horse is afflicted located in the foot.

The external or outer covering of the foot is the hoof, which is divided into the wall or crust, sole and frog; the wall being the outside covering, which is divided into toe, quarters, heels and bars. The outside surface of the wall is secreted from the coronary band, a band of blood vessels that is found around the upper border of the hoof. In many diseases of the foot we apply blistering agents to this band to stimulate its secretive power, thus producing horn faster, and by so doing a new wall is soon grown down. The toe of the fore foot is the strongest portion of the hoof and also the thickest, while in the hind foot we find the thickest part of the horn at the sides and heels. Nature wisely provides this wonderful arrangement of horn to meet the different requirements of the foot at these different parts, the weight of the forepart of the body

falling on the toe more than on the heel, while the weight of the hind part of the body falls nearly entirely on the quarters and heels. Continued under the hoof toward the center of the foot is a part of the wall which we call the bars, which meet in a point and form a space for the frog, which lies between them. The frog acts as a shock-destroyer when the weight of the body strikes the ground, and together with the plantar cushion—an elastic cushion found immediately under the small bones of the foot, which also assists in relieving much of this shock—

Moisture applied in different forms is the only remedy for this brittle condition of the horn, and is best supplied by cold water either in the form of cold swabs covering the hoof and extending up to and above the coronary band, or by allowing the feet to rest in a soaking tub of cold water for short periods at a time. If the swabs are used, they should be changed often and never allowed to remain on the foot after the moisture has been absorbed. Equal parts of pine tar and sperm oil, mixed, make a valuable hoof dressing, while for a packing, to soften the sole and



Apologies to Farm Imp. News

PROTECT YOUR CHILD OF PROFIT FROM THE STORM OF ADVANCED COSTS BY RAISING THE UMBRELLA OF SELLING PRICE

has a very important function to perform. The frog also prevents slipping and aids the foot in getting a firm grip on slippery and uphill surfaces, and, unless for good reasons, it should not be touched when shoeing the foot. The horn of the wall is composed of a fibrous texture joined together by a flexible membranous substance, and if not properly cared for loses much of its elasticity and becomes hard and brittle.

frog of the foot, common blue clay found in a great many parts of the country will be found most useful and as good as any of the prepared products offered for sale. Petroleum, or what is commonly known as vaseline, is one of the best substances that can be applied to the foot to keep it soft, and mixed with tar it is used as a dressing for the horn of the hoof. An excellent hoof cement that has come to my notice recently is prepared as follows: Gum



turpentine, 1 av. oz.; gum ammoniac, 3 av. oz.; gutta-percha, 6 av. oz. The first two are melted together by means of a water bath, then added to the gutta-percha, previously melted, with constant agitation. When it is to be used the cement should be softened in hot water and pressed in the hoof crack, which has been previously well cleaned. The above is a formula from the Physicians' Drug News and can be prepared by any druggist. Lampblack can be used if a black color is desired.



A Trio of Forging Stunts

BERT HILLYER
To Forge Cleats

A quick way to forge cleats like the one at A, Fig. 1, is to make a tool, F, with the impression of a ball on the inside so that the band, B, can be slipped on as shown at D. This band should be made strong, as there is a great strain on it when spreading out the plate part of this forging. In making the band it is forged the full width of the block and then a piece is cut out for the handles of F, as shown. The spring tool forms and trues up the ball after it is roughed out and also acts as a heading tool to flatten out the plate after the band is slipped on. Before the piece is put in the tool for flattening it should be heated up to as soft a heat as can be had without injury to the metal. A thin strip of iron if laid on top will help to spread the metal rapidly. This must be moved around in various directions as the hammer strikes it.

At C in Fig. 1 is shown the piece forged on the bar. At D the piece is cut off and put in tool ready to be

flattened out. After coming out of tool it appears as at E; a hole is then drilled in the ball just large enough so that when hot it will expand enough to take the round rod which is driven in cold. The completed forging is shown at A.

A Ring of One-Half Inch Square Stock

A ring of one-half inch square stock, which when finished is twisted its entire length, including weld, can be formed by making a spring swedge with the impression of the twist sunk in it; this does the welding and shapes the twist at the same time. The ring is made with a short lap, the twist following it up as far as possible. When at a welding heat it is placed in tool and welded. The fin that forms on the edge is then cut off.

How to Make a Socket Rod

If the readers would say whether or not they had power in their shop, it would make it easy to answer their questions; for the methods would be entirely different in forging on the anvil to what it would be under a power hammer. Another thing, a rough sketch would give a better idea than a great number of words. To make a forging on the anvil as at A, Fig. 2: turn a collar as at B, lapping it over for welding. Make a stem as at C and insert this inside of collar nearly up to shoulder, then take a good welding heat. When bringing out to weld, insert a piece of round iron or pin in the other end of collar so that it touches the end of the stem. Then weld up in swedge

block. If the pin sticks in the hole after welding, place collar at edge of anvil with pin lying on anvil. Take a cold cutter, place on pin in a slanting position, and a few sharp blows drives it out. In making this socket head under a steam hammer it is made from the solid, punched and shaped in one heat by special tools which I will describe if any of the readers wish me to.

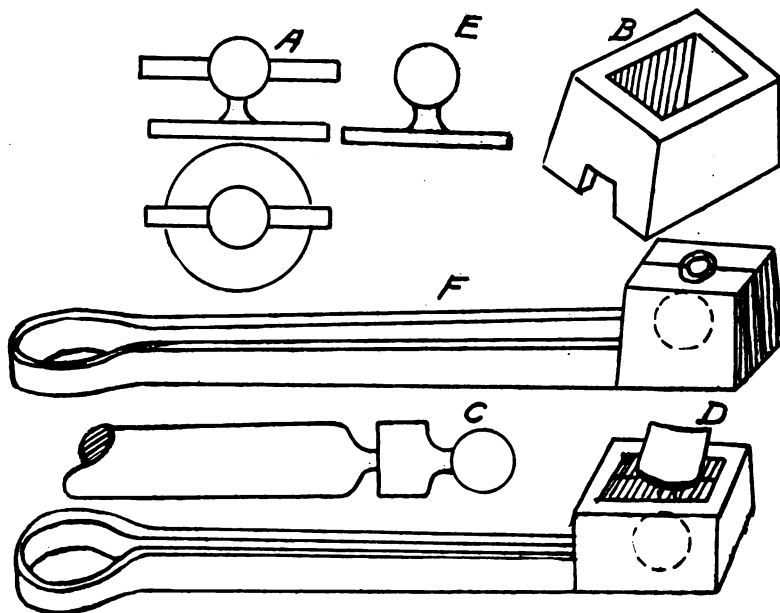
System and Regulation for the Blacksmith

Shop—2

JAMES CRAN

Keeping Track of Time and Material

Keeping track of time and material in a blacksmith shop is a little more complicated than is at first apparent. Regarding time, the same number of pieces might occupy several more hours to forge than they did at a previous time of forging. The reason for this is that there is not always the same access to steam or power hammers. Let us presume that three or four blacksmiths have, of necessity, to use the same steam hammer to block out their work, and that one is obliged to wait until the other gets out of the way. They all are hindered more or less; whereas, at other times there might be free access to the hammer, permitting the workman to complete his job in much less time than was occupied previously. The same argument holds good on material. A blacksmith may have to forge a



AN EASY METHOD OF FORGING CLEATS



hundred duplicate pieces, the material for which is supplied to him in full length bars. This enables him, if he knows just how much stock is required for each piece, to get out the

department, together with the card, and is deducted from the amount issued. On the other card, the workman's time for the work is recorded, either by filling in with pencil or

be taken when cutting from the bars to cut from the ends not painted.

Steel used for machine tools at lathes, planers or other machines should be designated by numbers; this is a much easier method of keeping track of the various kinds than by marking them with the initial letters of the brand. Should there be two or more grades of the same brand, the same number would hold good for all, and the grade can be represented by a decimal. A list of the various brands and grades with the numbers representing them should be supplied to the man in charge of the tool department and also to the blacksmith who forges and hardens the tools. Another good reason for having the different brands of tool steels numbered, in preference to marking them with the initial letters of the brands, is that the average machinist who uses the tools has a favorite brand which, according to his theory, is superior to anything else on the market; and, if he is not supplied with that, the steel which supplants it is responsible in his mind for all the poor work he turns out. Therefore, it is as a general rule better to keep the machinist with his prejudices entirely ignorant of the brand he is using. Then he will invariably call for tools stamped with the number that gives the best results.

Forwarding Work

As soon as a batch of forgings have been completed in the blacksmith shop they should be forwarded to the

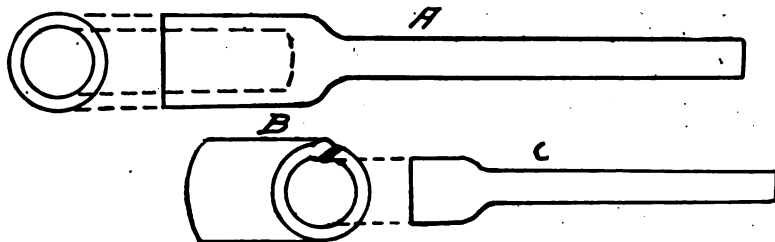


FIG. 2—MAKING A SOCKETED END ON A SOLID ROD

work with comparatively little waste—not more than a short cutting from the end of each bar. But should he be supplied with short cuttings of bars, as is generally the case when a number of short pieces of stock have accumulated (the blacksmith shop being a good place to work up odds and ends of material), the chances are that more or less of each of the short lengths will be left over after so many forgings have been made from them. Thus, there is as much or probably more waste on each of the short pieces than there might be on a full length bar, and this is responsible for the variation in the amount of material used at different times. Conditions of this kind, however, are not generally understood in the office, and more or less explanation and sometimes argument has to be put up to the cub from the cost department to convince him that the workmen have not carried the extra material away with them.

The best method that the writer has seen of keeping track of time and material used in getting out work in blacksmith shops is to have double cards for workmen; one card being for time and the other for material. These cards are perforated so that they can easily be torn apart. When the man in charge gives a workman a new job, the name and number of the piece or pieces to be made, together with the workman's name and number and any other data that may be necessary, are filled in on both cards. The quantity, dimensions and grade of material required are entered on the material card only, which card is used by the workman as a voucher at the stock department. The amount of material issued for the job is charged on the card. When the work is completed, any material that may be left over is returned to the stock

department, together with the card, and is deducted from the amount issued. On the other card, the workman's time for the work is recorded, either by filling in with pencil or

Keeping Materials Separate

Where iron and steel bars are handled by various employees in the same department, the different grades, etc., are very liable to get mixed up, and sometimes serious trouble is caused by having some of them made into forgings for which they are neither intended nor suitable. To overcome this it is a good plan to have the different kinds and grades marked on the ends of the bars with different colors. For example, machine steel bars from .15 to .25 carbon may be painted white; from .25 to .35 carbon, yellow; low grade carbon tool steel, brown; high grade carbon tool steel, blue; wrought-iron, red; etc. Care should



A GENERAL BLACKSMITH SHOP OF UTAH—THAT OF MR. THORSTEIN PETERSON



next department having work to do upon them, as there is nothing that has a more demoralizing influence upon a workman's interest in his work than to have the pieces he has made lying around for several days; especially if he has made them under the impression that they were needed by a certain date. It is also poor policy if a blacksmith has done his best in his employer's interest by getting out a piece of work that happens to be urgently wanted (ahead of record time), to expect him to do the same thing the next time the same job comes along.

Discipline

Discipline is often valued too highly. However, a certain amount is always necessary, but best results are generally obtained from men who are allowed a little leeway; they invariably respond better to a call for a hurry-up job if they are not tied down to hard and fast shop rules. In some shops the blacksmiths are expected to remain by their forges and keep their fires going up to the minute the whistle blows. This on the face of it seems to be all right; but there is another side to be taken into consideration. Suppose it is so near quitting time that a blacksmith does not have time to take another heat upon his work before the whistle blows, or if he could take the heat, not be able to work it. It only results in a waste of energy and fuel to compel him to keep his fire going. It is also a waste of energy to keep him standing while his work is heating, when he would be much more comfortable and be resting at the same time by sitting on his tool rack. It is also foolishness to compel him to stand up when he has to do some work that will permit of his sitting while he performs it, as he will generally accomplish more in less time if he is comfortable.

Keeping Scrap

Even in blacksmith shops where system is in force it is only on rare occasions that any attention is paid to scrap, further than to collect it and put it all in one heap; in which condition it is worth nothing more than the price of the lowest grade material it contains. If each kind is kept separate, the value of all of it is very much increased without inconvenience to anyone concerned. This separating can be done by having a

few barrels or boxes in the blacksmith shop into which the different grades and kinds of scrap are put when collected. Wrought-iron scrap is worth more when kept separate than it is when mixed with any kind of steel.

Time and Material Records

The man in charge of a blacksmith shop will as a rule simplify things for himself and save much time by a little judicious record-keeping. No matter how well he can figure he will

\$10.00 in Prizes

At Dresden Machine Shop

¶ Everyone knows that in my business December is usually a slack month, and for this reason I am going to give the public a chance to obtain a rake-off.

¶ To the three parties bringing in the most CASH work during the month of December, I will give as a New Year's gift \$10 in work to be divided thus: First prize, \$5.00; second prize, \$3.00; third prize, \$2.00; and to all others a discount of 10 per cent on all cash work. Prizes to be worked out any time during the coming year.

¶ In order to secure one of these prizes all work must be paid for by January 1st. Take advantage of this offer by bringing in your spring work and lessen the rush later on.

¶ Dental work will be included in the above offer.

H. E. Parkhurst

HOW ONE PRACTICAL SMITH SUCCESSFULLY GINGERED UP A SLACK MONTH AND LOOSENED UP SOME CASH

Low or high grade carbon steel is also worth more when kept separate from each other or other metals, and high speed steel scrap when separate from other metals has a market value at least equal to scrap brass or copper. Therefore, system of the right kind even in the scrap pile can be made a paying investment.

not always arrive at the exact amount of material required for a forging; but he can always tell just how much will be required after the forging has been made; therefore a record should be made of the work when it is finished. This can be done by making a free-hand sketch of the piece, and filling in the dimensions and quantity



of the material required and the time occupied. By referring to the sketch when the same forging has to be made the next time all the information necessary can be had at a glance.

should be employed in making blacksmith tools; as he will soon become an expert and turn out more and better tools than the man who only makes one occasionally.

In bending iron pipe I use sand. The first thing to do is to be sure the sand is dry. Just as well fill with gunpowder as wet sand. It will create steam and burst the pipe. Cap one end of the pipe and fill pipe full; then fit a wooden plug so it will just drop in. Now take a cap for the other end, force the plug down and screw cap down hard. I find this better than two caps alone, as with them the sand is apt to be loose. Heat even and bend on a form, a flat one will do, but better still if you can have a hollow one to fit the pipe. If the pipe is long I fit and drive a wood plug in, then fill as far as I wish, drive in another plug and heat and bend, then heat and burn the plug out.

I bend a good many without filling; heat short and bend a little at a time. I bent in this way not long ago a pipe four inches in diameter with a six-foot radius. It takes time and care, but it can be done.

That Smith-Shop Accounting System

N. R. SPOPE

Mr. J. R. Jennings' article on "A Simple System of Accounting, for the Smith-Shop" in the December number is very much the same as the system I employ. However, I believe I can add a few suggestions as per the accompanying sample entries.

Fig. 1 shows how I deal with the occasional customer; one who usually pays as he goes, yet may sometimes have jobs charged for a short time only. Such as these I put in the "miscellaneous" account, which saves opening many accounts which perhaps would not be used again for a year.

MISCELLANEOUS ACCT.

Nov.	10	John Jones Sharp Plow		25	Dec.	5	John Jones By Cash		25
"	12	A. Hughes Rep. Wagon chd. to P. & L.		2 50	"	16	A. Hughes N. G. moved see P. & L. Acct.		
"	12	H. Ruby Rep. Auto. 1-40.		60	Dec.	16	H. Ruby By Cash		60
"	"	3 d. Snyder 3 hrs. on gas engine @ 50		1 50					

FIG. 1—A SPECIMEN PAGE OF MISCELLANEOUS ACCOUNTS

These sketches may be kept convenient for reference either by a card index system or in a book with alphabetical index. Not only does this method of record-keeping save time and worry for the man in charge of the shop, but it is of some value in making estimates and comparing the number of hours occupied at different times in getting out the same work.

Drawings and Blueprints

Drawings and blueprints should be kept in racks or shelves, in consecutive arrangements according to their numbers or marks, so that they can be found without trouble. It is also an advantage on large drawings or blueprints that have to be folded to attach linen pasters with the numbers and other marks necessary for identification on them, so that they can be seen without removing the drawings from the shelves.

Arrangement of Forges

In shops where there are a number of forges the work should be graded as far as possible—light, medium and heavy; the forges for the heaviest work being, when that is possible, nearest to steam hammers. Those for medium work, next; and those for light work wherever they may be most convenient.

Usually more and better work can be had from men who are allowed as far as convenience will permit to remain on the same line of work than if they have light work one day and heavy the next.

Tools for the Shop

When the blacksmith shop is large enough to permit of it, one man

A great deal more could be said upon system for the blacksmith shop; but conditions, etc., have always to be considered before system can be suited to them, and thus more upon the subject might only be a superfluity. But the few suggestions here given which can be applied to any blacksmith shop may help to save a little time and worry.

How to Bend Pipe

H. N. POPE

First be sure the goods are annealed, not in spots, but nice and even. Then heat some resin and pour it in until the pipe is as full as necessary, i. e., fill up that part which is to be bent so as to get a good backing. Have a form with no sharp corners which fits the pipe; if covered with leather so much the better. Take time and use care and you will succeed. Don't try to do too much at a time, as the brass will harden in bending and will have to be annealed again.

A									
L. SMITH									
1908	July	5	To Rep. Binder	3 75	1908	Jan.	1	By Suspense	5 25
"	"	10	To Rep. Shovel	1 50					
B									
SUPENSE ACCT.									
1908	Jan.	1	L. Smith	5 25	1908	Jan.	10	By Cash	5 25
"	"	1	R. Hill	3 50					
"	"	1	C. Cook	2 65					

FIG. 2—SHOWING HOW DOUBTFUL ACCOUNTS ARE CARED FOR



DAY BOOK

Oct.	3	J. H. Detmer & son Rep. scoop end gate	Ord.	75
Oct.	5	T. Mathews 2 front shoes 60 2 reset 40	1	00
36				
Oct.	5	J. H. Wade Rep. wagon box 2.75 2 strap bolts .35	Pd 3	10

FIG. 3—ENTRIES IN THE DAY BOOK ARE FOR BOTH CASH AND CREDIT

Fig. 2 shows how I dispose of accounts that are not exactly worthless, but are doubtful. These I charge to the "suspense" account. I can call to mind an account that was paid after seventeen years and which was not considered worth the time to try to collect. Now by adding up the debits and credits of this account and taking their difference you can quickly tell how much you have outstanding in petty charges at the end of each month. You will notice how A. Hughes' account is disposed of in Fig. 1. The entry on the right side is simply an explanation; no money credit being given in the money column.

In Fig. 2 at B is shown how a man is given credit for his money should he ever pay the account.

By treating this account in the same manner as we did the "miscellaneous" account, viz.: take the difference between the debits and credits, we can easily tell how much of our expense accounts are still unpaid, and if after many years they remain unpaid they may be closed by "profit and loss", to rid our ledger of them entirely.

Inspection of this daybook page, Fig. 3, will show how much of the day's work has been paid for in cash and how much will have to be posted at the end of the week or month. The figures 36 at T. Mathews' account indicate the page of the ledger upon which this man's account is found. A year from that date you can tell him how much he paid for a job; or T. Mathews might contend that your job of shoeing was faulty or that his horse had not been shod for more than four weeks when

next he came in, which might be December 16th. By referring to the ledger and then to the daybook you can easily show him when he had the last work done.

Rev. Dr. Collyer's
Anvil

(Daily Paper)

It appears that the anvil in the blacksmith shop of the father of Rev. Dr. Robert Collyer, beside which the son learned his trade, is carefully preserved by the society of Unity Church in Chicago, of which the blacksmith preacher was pastor for 20 years from 1859, before going to the Church of the Messiah in New York City. How that relic was obtained is thus related:

A parishioner, traveling abroad, happened to visit the birthplace of Collyer in Yorkshire, and stumbled across the old smithy, almost hidden among the newer houses of the growing town. The visitor inspected with some interest an old anvil standing in one corner of the shop.

A PRIZE CONTEST

From time to time we receive very clever letters from our friends and subscribers—letters full of original thought—some humorous, some grave, all good, pleasant reading. To encourage clean, clever, original letters of this kind we offer prizes as follows:

FIRST PRIZE - - \$50.00 IN GOLD

SECOND PRIZE - A GOLD WATCH

THIRD PRIZE - - A FOUNTAIN PEN

for the cleverest letter accompanying a subscription remittance of one dollar or more and received during 1913.

The letters may be humorous or grave; they may contain kicks or bouquets; they may be written in rhyme or prose—but they must be clean, clever and original, and accompanying a subscription remittance of one dollar or more.

As an example of the kind of letters we want, the following received from Mr. Tom Roop of Ohio is an exceedingly clever one:

Dear Editor Bernhardt:—

Please find enclosed an unfolded sample sheet of Uncle Sam's paper of recent issue upon which you will observe certain figures and pictures, solid valuable reading matter and no fiction. No claim is herein made that this enclosure in weight or intrinsic value equals your yearly enclosure to me, but it is customary for an orthodox subscriber when he has a \$ about his person for which he can find no present or future use to shy it at the Editor's plethoric purse through the mail or by some other artful agency, and against his vicious practice the hapless Editor seems to have no adequate means of self-defense.

Your sympathetic friend,
Tom Roop

P. S. I will surprise myself and take out two years', Christmas.

Get your "funny bone," your "bump of cleverness" and your "dome of originality" to working—make a grab for those fifty round little pieces of Uncle Samuel's favorite product. Get busy now, whether your subscription expires now or later—but get busy, then you'll have your letter ready. Remember—cleverness and originality are the deciding points. The judges will be announced later. The contest closes, December 31, 1913.



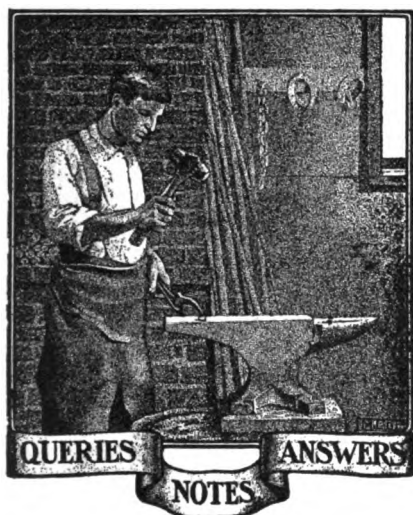
"How long has that anvil been here?" he asked of the proprietor.

"Why," said the blacksmith, "it must have been here nigh 30 or 40 years."

"Well, I will give you twice as much for it as will buy you a new one."

"Certainly," replied the puzzled smith, "but I would like to know what you want with this anvil."

"I will tell you. There was formerly an apprentice in this shop who used to work on it. That boy has now become a prominent man. Thousands love and honor him as a friend and teacher, and I wish to carry this anvil with me to America, as a memorial of the humble beginning of his life."



Tire Heating Furnaces.—I would like to hear from readers of THE AMERICAN BLACKSMITH who have built tire heating furnaces.
J. J. CHALLIN, Alabama.

A Chisel Query.—Can you tell me the cause of circular cracks coming in a cold chisel something like illustration? I try to be very careful in dressing my chisels, but they will crack like this often. I would like to know how to prevent it.

H. W. POPE, Wisconsin.

Kerosene Forges.—I would like to hear through our paper from some brother who uses the kerosene forge; some information as to its practicability, the work it is especially suited for; and any other points on it would be much appreciated.

J. W. DELLEY, Queensland.

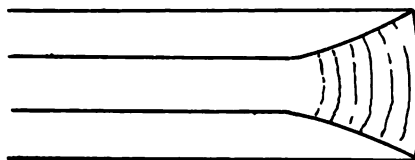
Emery Grinders and Disc Sharpeners.—I want to install an emery grinder for grinding tools and cast plow points. Also a disc sharpener, both of which will be run by power. Please advise the best make for my use. I feel that "Our Journal" would be the proper place to get such information.
JAS. J. CHALLEN, Alabama.

Machine Taps.—Will someone please explain the sizes given on machine taps and dies in your next issue? For instance, why is a $\frac{1}{4}$ tap marked thus when it is over $\frac{1}{2}$ inch in diameter? I have been a reader for

over six years and have not seen this explained, although blacksmith sets and the different style threads are fully explained.

LUKE BLABEY, Manitoba.

Questions on Selling and Values.—I would like to hear through your paper of the best way to rent a blacksmith shop.



WHAT CAUSES THE CRACKS

What per cent for depreciation should one figure on, and what interest could one expect on the investment? Also, what are some of the best ways to get at the value of a shop to buy or sell it?

I would like to hear from some smiths who hire men on a commission basis. What do they pay and what do they furnish?
A READER.

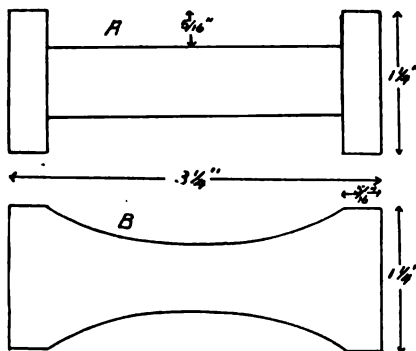
Curing a Spavin.—Please advise me through your notes and queries how to cure a spavin on a horse.

HOWARD KELENBENZ, New Jersey.

In Reply.—First of all relieve the animal of all active work. Allow the horse to rest—the longer the better, and a month is none too long. Then by means of cooling lotions bathe the parts to lower the temperature. Now apply a blister of cantharides in the form of ointment or liniment and alternate with paintings of iodine. This treatment will usually relieve the spavin if persisted in. However, should these remedies be inefficient, a veterinary had best be called in to use the firing iron.
L. C. M., Ohio.

A Query On Auto-Painting.—While we have been silent readers for several years, nevertheless we enjoy THE AMERICAN BLACKSMITH very much, and we are going to furnish "Our Journal" with something in the near future.

What are the customary prices for painting automobiles? Cars of the following makes: Ford runabout; Ford five-passenger; E. M. F. 30 and 20; Country Club Rambler 50; Krit 25-30, etc. Work will be done about as follows: (according to conditions) Paint removed as deep as



IS THE SHAPE OR THE HARDENER AT FAULT?

cracks show, or all removed. Then to proceed as follows: Glazing, one coat, 36 or 24-Hr. lead; then one coat of quick lead; five or six coats of rough stuff (if rough stuff is removed), one coat flat, two lead color. One coat of quick rubbing color. Stripe and finishing.

J. G. LAUER, Missouri.

A Hoof Ointment.—I send a recipe of an ointment for horses' hoofs, sand cracks, etc. I got this recipe from a farrier, a man of great experience at that work. I had a mare with a very bad hoof, all the outside shell got diseased, and he cut off the diseased part all around into the quick and I applied the above ointment and now she has a better hoof than ever. Perhaps it may be of use to some farriers.

$\frac{1}{2}$ lb. of mutton kidney suet; 2 pence (4 cents) worth of beeswax; 2 pence (4 cents) worth of pitch; 2 pence (4 cents) worth of white resin; 3 pence (8 cents) worth of turpentine; 1 pence (2 cents) worth of verdigris; 1 gill of sweet oil, and melt all together.

Some of these ingredients are no doubt sold differently in the United States and in other countries, but a little experimenting mixed with commonsense will tell the best proportions.

THOMAS O'HALLORAN, Ireland.

Annealing Window Weights.—Kindly tell me whether window weights or chilled iron can be annealed or not? If they can be annealed, kindly state how.

J. A. DAVIS, Maryland.

In Reply.—Window weights are not, as far as we know, treated in any way that would harden them. It would not be necessary to anneal them in order to work them up into some other form as you undoubtedly intend to do. The weights are usually common, ordinary castings, and the reason that they appear hard is because of the scale which forms on their surface in the process of casting. If you desire to remove this scale from the weights we would suggest the following: Make a solution of one part vitriol and two parts water; after mixing thoroughly, apply the solution to the scale either with a brush or by means of a cloth wrapped around a stick; using just enough of the liquid to wet the surface well. After eight or ten hours, wash the weights in water, and the hard, scaly surface will be completely removed.

A. O. M., New York.

Several Questions.—I would like to ask a few questions through "Our Journal." First: Is there any way of getting the mercury together in a thermometer? In the one I am using, the mercury stays at 450° while going down. I have run it up to 700° F., trying to remedy it, but it did no good. It registers from 200° F. to 1000° F. Second: What temperature are knurling tools drawn to? I have some to do $3\frac{1}{2}$ inches by 3 inches and 8 inches diameter by 3 inches thick. They are used to knurl the passes in a steel rolling mill. Third: What is the best way to harden a tool that is $3\frac{1}{4}$ inches in diameter by $1\frac{1}{4}$ inches thick and is recessed about $\frac{1}{8}$ inch on both sides, with sharp corners as per engraving at A? I have hardened two, and both of them broke at the bottom of the recess. I think if they were shaped as at B it would help. They are used to make oval passes in rolls. No temper is drawn, but I put them in boiling water to relieve the strain on them. I use a salt bath for hardening and a carbonaceous paste while heating in a gas furnace. And before I close I wish to say that THE AMERICAN BLACKSMITH is helping me. All of the copies I get I put in one of your binders and keep them for reference.

J. W. H., Ohio.

On Welding Tires.—I just want to say a word in defense of myself. Brother Hoban says he can weld a tire while I am getting one ready to weld. When I wrote my article I thought I was showing how to get away from that old-time scarfing which took more hammering than it did to weld the tire.

Brother Hoban says he simply cuts his tire to length, cold in the shears, and welds without scarfing. Sure, tires can be welded without scarfing, but suppose you did not have the shears and even when you have them how much easier and quicker it is than to cut them hot—because I find that the ends of a heavy tire will not always bend so as to lap tight together. I notice one place in my article that is wrong; instead of driving the two ends apart with a hot chisel, the helper slips them apart with a sledge. I cut off Y, hit the edges two licks and hit X a few licks to make it fit tight up under Y. You will see in the engraving, T, that the two ends are nearly straight. I weld light tires the same as Brother Hoban does, only we haven't any shears that will cut them after they are bent. I also said to cut $\frac{3}{8}$ inch shorter than your wheel, but of course you will have to use your own judgment about that. You will now see that I am not trying to prove that Brother Hoban's method of welding tires is wrong, because if we had shears to do this work I would be doing about the same thing; only when the tire

If the "wind" in the band saw is not too great we would suggest a light hammering on the tight side of the saw. This hammering will tend to stretch the metal on that side and even up the two sides of the saw.

The red lead which you are using for the joints of the acetylene gas pipe should work successfully if the lead is of good quality. However, if you desire to use a cement, we would suggest the following:

$2\frac{1}{2}$ parts of zinc oxide; 1 part of zinc chloride; 5 parts of pulverized limestone. Add sufficient water to these ingredients to form a thick paste and use the same as red or white lead. It must be borne in mind however, that the joints made with this cement will be almost impossible of separation after the cement has set.

A. B. C., New York.

Concrete As a Shop Building Material.—I would like to ask a few questions through your paper in regard to building a concrete blacksmith shop. I am planning on building a solid concrete wall, and would like to hear from some brother blacksmiths in regard to it. Will the walls gather frost on the in-

[For other data on concrete and cement construction see page 25, October, 1912; page 99, October, 1908, and page 275, August, 1911. THE EDITOR.]

How to Temper an Anvil.—In your issue of November 1st you printed a letter from Mr. H. C. Palmer, Kentucky, in relation to the matter of tempering a Peter Wright Anvil of 190 lbs.

It is rather a difficult matter for a blacksmith to reharden his own anvil with entire satisfaction, although there is no absolute reason why he should not if he will follow the suggestions made.

The chief difficulty lies in the fact that but few blacksmithshops are equipped with appliances that are entirely suited for doing this work.

The chief requisites consist of a large volume of water, preferably in such form that it can be kept flowing during the process of hardening. In addition, a large fire is almost absolutely essential, in order that the anvil may be heated not only all over the face but in addition about two or three inches down into the body at a regular and even temperature.

This temperature should be such as to bring the anvil slightly over a cherry red and, moreover, it should not be raised to this color too suddenly, but the heating should be done rather slowly.

It is of advantage to hammer the face of the anvil with a flat faced hammer after the heat has been brought to the point mentioned.

If this process of hammering causes the anvil to get too cold it should be returned to the fire again for a few minutes to bring it back to the proper heat.

If the anvil is wanted to be quite hard it is a good plan to put a piece of potash on the face about as large as a fair sized walnut. This will turn more or less liquid from the heat on the face and should then be rubbed evenly over the face.

Before putting the anvil into the water it is advisable to slightly cool the edges. This can be done by pouring a little water along the edge so as to reduce the temperature very slightly on the edges. Or there is, as a matter of fact, nothing much better for the purpose than to take an old broom, dip it into water and draw it along the edges of the anvil a few times.

The anvil should then be plunged bodily into water, and if flowing water is not available the water should be agitated very rapidly for some minutes with a paddle. It is very desirable, although not positively necessary, that the anvil should be suspended in the water so that the water can flow all around it.

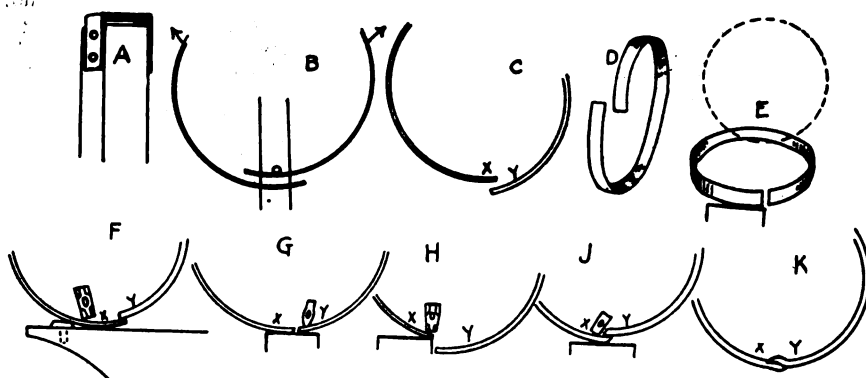
Of course, in the process of manufacturing anvils there is a special arrangement by which the water flows from a considerable height in good volume in a direct line to the face of the anvil which, moreover, is at the time submerged from six to eight inches under water.

In your reply to Mr. Palmer you are perfectly right in your position that the steam arising from the face of the anvil should be kept away from it by the use of a paddle. The effect of the flowing of the water on the face of the anvil is to remove this steam rapidly and replace it continually with a fresh supply of cold water.

As this subject may be of the very greatest of interest to many blacksmiths, you, of course, are at perfect liberty to publish the above remarks if you desire.

Many anvils are more or less spoiled by the blacksmith allowing them to get "too hot" in working on them, and failing to cool them down with a little cold water.

PETER WRIGHT & SONS, through
WIEBUSH & HILGER.



WELDING TIRES EASILY AND QUICKLY

got red I would take it out and fit the lap tight together. But if I were to weld a heavy tire that way I would want a heavy weight striker.

Well, I live in Ohio; but when it comes to welding a tire while I am getting one ready to weld then I am from Missouri.

P. V. JOHNSON, Ohio.

Several Questions from Ireland.—I will feel obliged if someone would let me know which hammer they would recommend for general work. I learn from the advertisements that certain makes are able to weld tires, and that would be of great value to me, as I do a good lot of that work, and I suppose a steam hammer could not do such work. I will be thankful if you ask through your paper if some brother would let me know what would renew the polish on brass work that is faded, what we call lackering in this country. Perhaps they may term it in some other way in America. Also, how can I take a wind out of a band saw? It is cutting to one side. Also, what would be a good mixture to staunch the joints of an acetylene gas pipe, as I repair such pipes occasionally. White lead and red lead I use, but I am sure there is something better.

THOMAS O'HALLORAN, Ireland.

In Reply.—With regard to the question on renewing brass work we would suggest the following treatment: Carefully polish the brass with fine crocus or rouge, then apply sufficient alcohol to cut all grease and old shellac on the brass surface. When dry, and perfectly clean, apply a thin coat of white shellac; this will preserve the high finish on the brass and also protect the brass from the tarnishing effects of the air.

side? About what thickness should the walls be? Is concrete a good floor in a shop? What way would be best to make the forms off? What would be the best way to reinforce the walls? J. E. MAYS, Wisconsin.

In Reply.—There is no more reason as far as we can see for a concrete wall to "gather frost" on the inside than for any other wall to do the same. A regular plaster wall will "gather frost" on the inside if it is damp and the weather cold enough to form frost. But other things being equal we cannot see why a well made, properly cured concrete wall should frost on the inside. We have a concrete wall shop—it is of block construction—and it is certainly the ideal material for a smithshop. It is an excellent floor material, after the men get accustomed to it, and it is very economical.

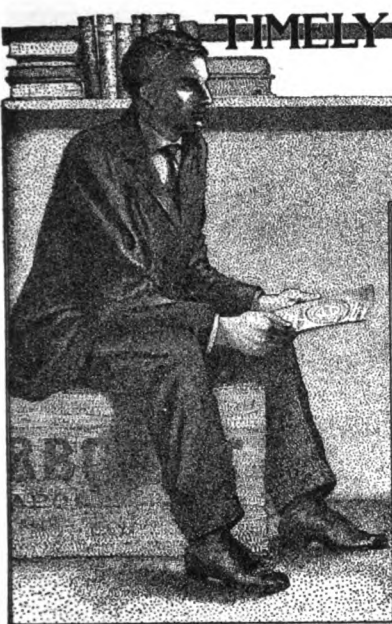
L. J. F., Kansas.

I would suggest that your querist use concrete block construction for his shop. If he is going to build the shop himself he will find the work easier and if he gets the right kind of blocks he will be more certain of his wall. On the other hand, if he builds a solid wall he will need to know something definite regarding reinforcing and anchoring, in order to get a wall that will withstand the weight and pressure he places on it. Concrete makes an excellent floor and needs little repairing.

H. L. B., Pennsylvania.

At first we thought our concrete floor was a mistake, but after getting used to it we would not return to the old lumpy, holey wood floor for a great deal. Our walls do not gather frost on the inside, but they are of hollow concrete blocks.

H. G. KLEIN, Ohio



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The Western Price List

That price list on pages 155 and 156 of this issue deserves more than passing attention. Copies of this price list are being distributed to the trade by the Western jobbers. These prices are suggested by the Heavy Hardware Association, and show what you should get for your work. If you are located in Iowa, Missouri, Illinois, Minnesota, the Dakotas, or in any other Western or Mid-Western State, ask your jobber for a copy of this price list. General smiths in other States may also find it of advantage to take this list as a guide.

For Our Shop Number

Don't forget our Shop Number for 1913. We will want pictures of good shops, pictures of well-equipped shops, pictures of well-built shops; and we'll want interior views, exterior views and views of good work. We'll want floor plans, shop layouts and descriptions of good equipments. We'll want descriptions of shop-made shop tools and machines. We'll want descriptions of labor-saving devices, handy tools, time-saving machines.

So, look about you—see how many items of your equipment you can describe for brother readers. Perhaps some ideas or things that you think commonplace are just what some brother is looking for. Let us have something from you—a picture, a description of your equipment or a description and sketch of some shop-made machine. But don't wait—send it in soon—we're working on the Shop Number now.

Subscription Agents

When a stranger solicits your subscription to THE AMERICAN BLACKSMITH, or any other publication, insist upon his showing you absolute proof that he is an agent in good standing and is employed by the publication which he represents. Don't, under any circumstances, give the man your money if you are not sure that he really works for the paper he says he does. No matter what the man offers you—no matter what price he makes—no matter what premium he promises to send—DON'T GIVE HIM YOUR MONEY IF YOU ARE NOT SURE.

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Figuring Profits

There are six or seven different ways of figuring profits. Two or three of these methods are correct. The other methods are dangerous.

The two or three correct methods give you all the profit you figure on. The other methods appear to give you more profit than they really do—that is why they are dangerous—that is why you want to have nothing to do with them.

Mr. Burroughs shows on page 151 how to figure profits in the most convenient and in the safest way. This is not the only way to figure to get correct results, but experience has shown it to be the easiest way to figure safely.

Some readers will no doubt disagree with Mr. Burroughs, citing in their arguments the old profit, cost and selling price methods of our schoolbook days. We believe, however, that "Fixing Prices to Get a Profit" will not only show you how to correctly and safely figure profits, but will also prove to you that the method is correct.

A Good Suggestion

From the biggest State in the Union we have just received the following letter:

"At the recent meeting of the Blacksmith's Union a motion was made and carried that every member of this Union should subscribe to THE AMERICAN BLACKSMITH. The writer has been instructed to apply for club rates."

Jos. MICHALKA, Texas.

Here is a hint for other locals,—county and State organizations—subscribe in a body and get a club rate. Write to the subscription department. Make a motion at your next meeting that each and every member become a subscriber to and regular reader of THE AMERICAN BLACKSMITH. What easier way to further the interests of the craft in your vicinity? What easier means of teaching your brother smiths the correct ways of doing business, figuring profits and keeping up to date? When the betterment of the craft is spoken of at the next meeting, give the boys a little talk on what "Our Journal" is doing; then make a motion—we'll make the price right.



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PRESIDENT TAFT GREETING WOODROW WILSON AT THE WHITE HOUSE

A few moments later they were on their way to the Capitol, where Mr. Wilson took the oath of office and became President Wilson



Rims, Tires and Tubes

Some Important Things the Repairman Should Know About Them

IT IS important that the repairman know how to remove tires, how to take off casings, how to handle inner tubes and how to proceed with the various makes of quick-detachable rims. Here are

hole and working the rim all round into the groove.

The locking ring is inserted most easily while the casing is being pushed back as much as possible. When this is done in the proper manner it is

the sides of the tire and exert a pulling pressure. The tire will now slide from the rim at the bottom, and the valve may be lifted from the wheel.

Care should be taken in removing the tube that the valve is not injured by being torn from its fastenings in the tube; otherwise a leak may be produced around the valve base.

Demountable Rims

Turn the wheel so that the valve stem is uppermost.

Apply the brace to the clamp and turn to left until the clamps swing at opposite angles from their locked position.

Grasp the tire, with the rim attached, at the bottom. Pull outward and lift the valve out of its hole. If the rim has not been removed for a considerable time, and sticks, a slight knock on the inside will loosen it.

Grasp the loose ends of the adjusting ring (Fig. 6) and press its ends toward the center of the rim, thus decreasing the circumference of the adjusting ring. The ring may now be easily removed from its position in the rim.

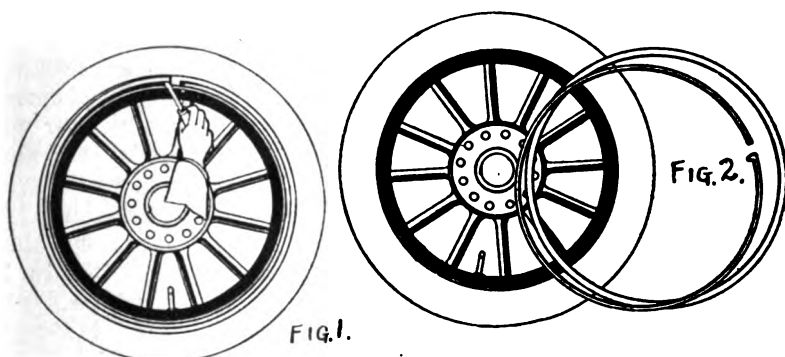


FIG. 1.
THE CASING IS HELD IN PLACE BY TWO SIDE FLANGES

given some useful hints on these various items of automobile equipment.

Quick-Detachable Rims (Standard Universal No. 2)

On this type of rim the casing is held in place by two side flanges, the outer one of which locks the inner one against the casing. To remove the locking flange, insert a screw-driver or similar instrument under the rounded end of the split locking rim and pry it outward. (See Fig. 1.) Once the end of the rim is pried out of the recess its remainder may be easily removed, the last part of this operation being to lift the studded end of the ring out of the hole in the wheel rim. The inner ring will now slide off the rim without difficulty, as shown in Fig. 2.

When replacing the flanges, push the casing back as far as it will go; replace the undivided ring and finally the locking ring, by first inserting the stud of the latter in the

not necessary to use a hammer in order to seat the ring into its groove.

Standard No. 50

Turn the wheel so that the valve stem is uppermost. Remove dust cap from valve stem. Make sure the tire is deflated. Insert screw-driver between latch lever and rim base, prying upward on the handle of the screw-driver, releasing the latch-lever lug from the hole in the rim base (Fig. 3).

Swing the latch-lever outward until it is at right angles with the rim, as shown in Fig. 4.

Insert the screw-driver in the notch at the base of the detachable ring (Fig. 4), push downward on the handle of screw-driver, and pry ring from groove, and with your fingers catch hold of the free end of the ring and pull outward, thus removing the ring from the rim.

Grasp the tire at the top with both hands, pull forward as far as the valve stem will allow, then gradually work your hands down

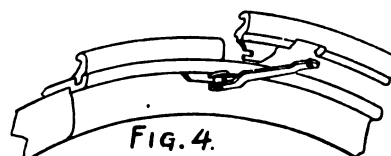
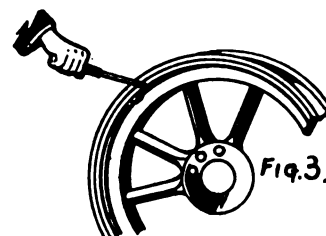
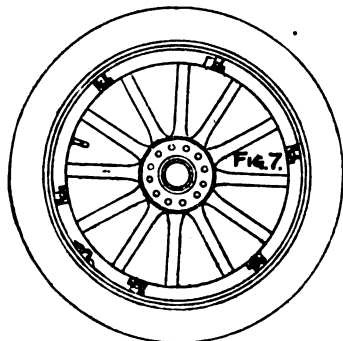
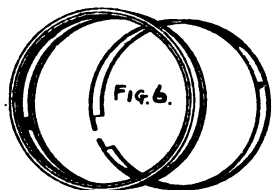
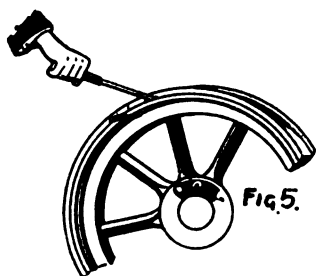


FIG. 3.
FIG. 4.
INSERT THE SCREWDRIVER BETWEEN LATCH LEVER AND RIM BASE



THE CLAMPS OF THE DEMOUNTABLE RIM ARE LOOSENED AND THE RIM AND TIRE THEN REMOVED

Place the adjusting ring in the spare rim to be applied, by holding the rim, valve uppermost, and placing the hole in the adjusting ring over the lug protruding from the rim. Hold the adjusting ring by its free ends, pulling them together, while pressing the ring into place.

Grasp the tire and rim at the sides, lift and insert the tire valve into its hole, and the rim with the tire will easily fall into place.

Tighten up all clamps. If the clamps do not turn into position, give a few backward turns to the nut and they will adjust themselves to the rim.

Tire Hints

Keep all oil and gasoline away from tires—they are solvents of rubber.

Tires and tubes should be kept in a place where they are not subjected to heat, light or rapid changes in temperature.

Don't pump a tire by guesswork. Use a tire gauge, and pump until the required pressure is reached.

When changing a tube always sprinkle some French talc or soapstone into the casing.

Always have a few spare valves and valve caps on hand.

Replacing Inner Tubes

When taking an inner tube out, turn the wheel until the valve stem is at the bottom, as in Fig. 8, and remove the tube, beginning at the top.

Always make it a point to run your hand around the inner side of the casing until you detect the cause of the puncture, because very often the offending object is hidden in the tire and cannot be seen or felt from outside.

Put in a new tube, or patch the old one in accordance with the instructions which will be given in this article; the inserting of the tube may be done with the casing remaining on the rim or with it removed. In either case it is desirable to turn the wheel until the valve stem hole is on top (Fig. 9). Before the side flanges are replaced, the inner tube should be partially inflated.

Then run your hand around the inner tube, smoothing out the creases and placing the tube evenly around the rim.

Do not inflate the tube too much, for, if you do, you will have difficulty in replacing the locking rim over the bead of the casing.

Inflate the tire carefully and test the increasing pressure with your hand.

Occasionally the tube is pinched under the valve base. Push the tire valve up with your hand before inflating. When the valve returns to its original position there is no danger of pinching.

Repairing Tire Casings

A hole in the tire casing is serious only when it is large enough to let the inner tube be blown through it. Usually this occurs with old tires which have been in use so long that the rubber tread has worn off and the fabric is weakened. In such cases no repairing will be satisfactory.

If there is a cut in a casing that is otherwise in good condition a temporary repair may be made and will stand many miles of running. Such repair consists of attaching a patch of one or two thicknesses of heavy canvas to the inside of the casing, in addition to which a blow-out bandage may be used on the outside. Material for such patches may be

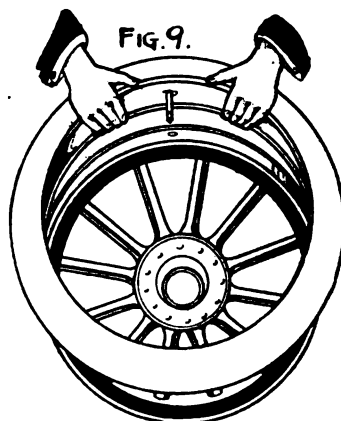
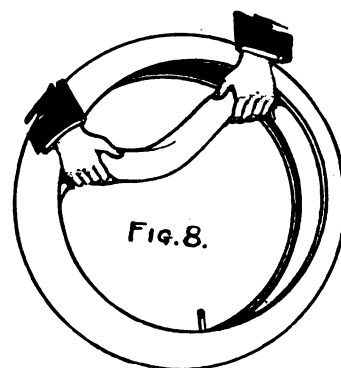
bought of any tire maker; it is known as friction cloth and is made of heavy canvas with a dressing of rubber cement on one or both sides.

The inside of the casing around the cut should be scrubbed clean with gasoline, and when it is thoroughly dry, three coats of cement should be applied. Cement should also be applied to the cemented side of the friction cloth and the cement on the casing and on the patch should be permitted to become "tacky," as in the case of repairing a tube. The patch should extend several inches on each side of the cut and should line the casing from bead to bead.

This, of course, is but a make-shift. For permanent repairs the casing should be "vulcanized."

Matching the Tires

Make it a point always to use tires of the same diameter. If there be a difference, this will cause unequal traction and the differential gears will work even though both rear wheels drive on even ground. If the use of different-sized tires cannot be avoided you had better use them on the front wheels. It is much better to have a 32 x 3½ and a 33 x 4 tire in front than on the driving wheels.



THERE ARE SEVERAL WRONG WAYS OF HANDLING INNER TUBES—FIGS. 8 AND 9 SHOW THE CORRECT WAYS



Cementing Tire Cuts

When overhauling a car, or doing any repairing on it, it will pay you to go over the tires carefully and pick out any bits of gravel or metal which may have become imbedded in the surface. The small cuts which they leave should be sealed with a good cement.

Repairing Inner Tubes

Do not attempt to patch tubes, except when there is no other recourse. If the puncture is a small one it may be located by inflating the tube partially and turning it around in a tank of water. Bubbles will indicate the exact location of the leak. Moistening the suspected spot with saliva will have the same effect.

Mark the leak with a pencil, if possible, then clean the spot around the leak with gasoline. After this, both the patch and the portion of the tube around the leak should be sand-papered until all the sulphur bloom has disappeared and both surfaces show the raw rubber. Care must be taken that the sand-papered spot of the tube is somewhat larger than the patch itself. Apply the tire cement to both patch and tube, allowing it to dry for a few minutes until it becomes "tacky," then apply a second coat of cement; allow that

should be vulcanized as soon as possible for perfect safety.

Before proceeding to patch a tube it is wise to examine it thoroughly to see whether there are any other punctures besides the one you noticed first.

In many cases a slow leak that is supposed to be due to a puncture may be traced to a leaky valve. To ascertain this, turn the wheel so that the valve is at the top and the valve stem hanging downward. Fill a glass full of water and hold it so that the valve stem projects into it. Air bubbles will show a leak due to weakness of the valve. A renewal of the inside valve parts will set things right.

Handling Inner Tubes

To fold an inner tube in the most satisfactory manner, the detachable part of the valve, usually called the "valve guts," should first of all be removed, as shown in Fig. 10, so that the air may easily escape during the later operation.

The tube should be rolled up as tightly as possible, beginning at the end farthest from the valve (Fig. 11). A large part of the air is thus driven out through the valve, but owing to the bend at the unrolled end it will accumulate there.

To get rid of it, hold tightly the rolled part with the left hand and draw the opposite end to the rear from time to time. Continue to do this until the tube is completely rolled, as shown in Fig. 12.

Still holding the tube as tightly as possible, insert the valve parts and put on the cap; screw it down as tightly as possible with the fingers, but no

account use the pliers.

The tube is now perfectly flattened, and its insertion in the casing, when necessary, is greatly simplified; at the same time it is protected from pinching or injury from a lever or tire tool.

The next step is to open the tube out again, as illustrated in Fig. 13, the valve being in the center and uppermost. Now fold each end of the tube inward toward the valve, as in Fig. 14, making the flat package shown in Fig. 15, which may be secured by a couple of rubber bands cut out of an old tube or with a piece of tape.



The paint on the hood will become blistered through the heat from the exhaust pipe. After painting the hood the recurrence of the happening may be prevented by the use of an asbestos shield, attached to the hood about an inch from it, on the inside. Solder two arms to the hood at the proper place, and to these attach a sheet of asbestos of the right size. The same thing may be done if the exhaust pipe chars or blisters the woodwork of the dash. A. C. B., Illinois.

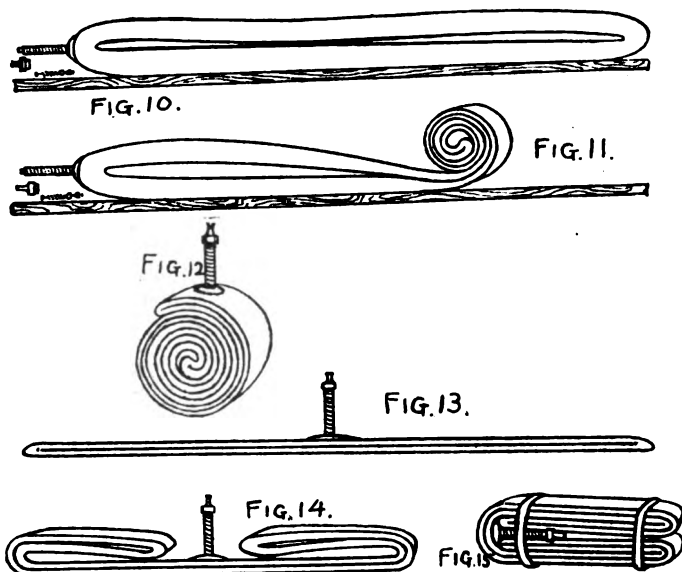
Overheating of a motor may be due to looseness of the fan belt, if the usual work of cleaning out the radiator, looking for leaks and inspecting the pump is of no avail. Much of the efficiency of the radiator depends on the amount of air drawn through it by the fan, and if this is not revolving at full speed the temperature of the radiator is bound to rise. Failure of the fan is usually due to a slipping belt, and tightening this by means of the adjustment provided will remedy the trouble. Before tightening the belt, however, test the fan to see that it revolves freely on its bearing. Occasionally, dust and dirt will get in the fan bearing and cause it to stick. With some belts, running them in reverse direction will sometimes cause them to hold better.

R. A. P., Illinois.

Repairing Broken Automobile Springs

GEORGE E. SHIPPEY

I use Vanadium steel for all repairs. My equipment consists of a Bradley hammer, drill press, emery wheel and heating furnace (for heating evenly in hardening and tempering) and an oil tank for quenching.



TO FOLD AN INNER TUBE SATISFACTORILY THE INTERIOR MECHANISM OF THE VALVE SHOULD BE REMOVED

to become "tacky," and finally put on the patch and squeeze it even. Press it between two flat surfaces, or stand on it until it is dry. Sprinkle the patched spot with soapstone.

The ordinary cement patch is not a permanent repair, and the tube



A spring may have but one leaf, broken, which may be the main leaf, or one or two bottom leaves or one or more leaves in some other part. They break in the center on the end or half way between. If the main leaf is the one to be replaced I cut my steel the right length, allowing for the eyes, bend the eyes and then shape the new leaf according to the broken one, being careful that the next leaf fits the new one perfectly and that it has the right distance between—which must be judged by the other leaves.

In tempering, I heat to an even heat the entire length, cool in oil and flash off once. If the fit is not perfect I pene while hot to get the right shape. If you use the best steel and get the right temper you can rest assured that your repairs will hold.

I give my card to all tourists traveling through here for whom I make repairs, and I often get duplicate orders in this way.

There are a great many cars on the market which have inferior springs, and when I am called upon to make repairs the owners tell me they can buy a new spring for a price about half or two thirds of my price. In making repairs on high grade springs an inferior steel is absolutely useless, as it will not stand up. I am always confident when I repair a spring and use vanadium steel that it is going to "stand up."

Automobile Hints and Remedies

A. J. STEIN

A good way to test the motor is to run it as slowly as possible; then notice if it acts perfectly. Very often a motor will operate or appear to operate perfectly at higher speed when it will perform haltingly at low speed. This missing at low speed is usually due to carburetor trouble or to the ignition. On the other hand if an engine performs perfectly at low speed it will act right at high speed.

Kerosene will often aid in removing a refractory nut or stud. Give the nut or stud a good dose of the oil and allow it to soak awhile. A wrench may now be carefully used and, as a rule, successfully.

In overhauling springs the bolts in the shackles at the end of the springs should be taken out and ex-

amined for wear. If they show much wear it is advisable, of course, to replace with new bolts.

Always make it a point to start a nut on the thread by hand. This will insure starting it right and will prevent spoiling both threads by forcing the nut on at an angle.

In using adjustable wrenches on nuts and bolt heads be certain that the wrench is correctly fitted—that the jaws of the wrench grip the faces of the nut tightly; otherwise the wrench is likely to slip around and damage the corners of the nut.

Be careful in tightening up bolts, nuts, studs and spark plugs never to run them up too tight. Just enough is just right—too much is too tight.

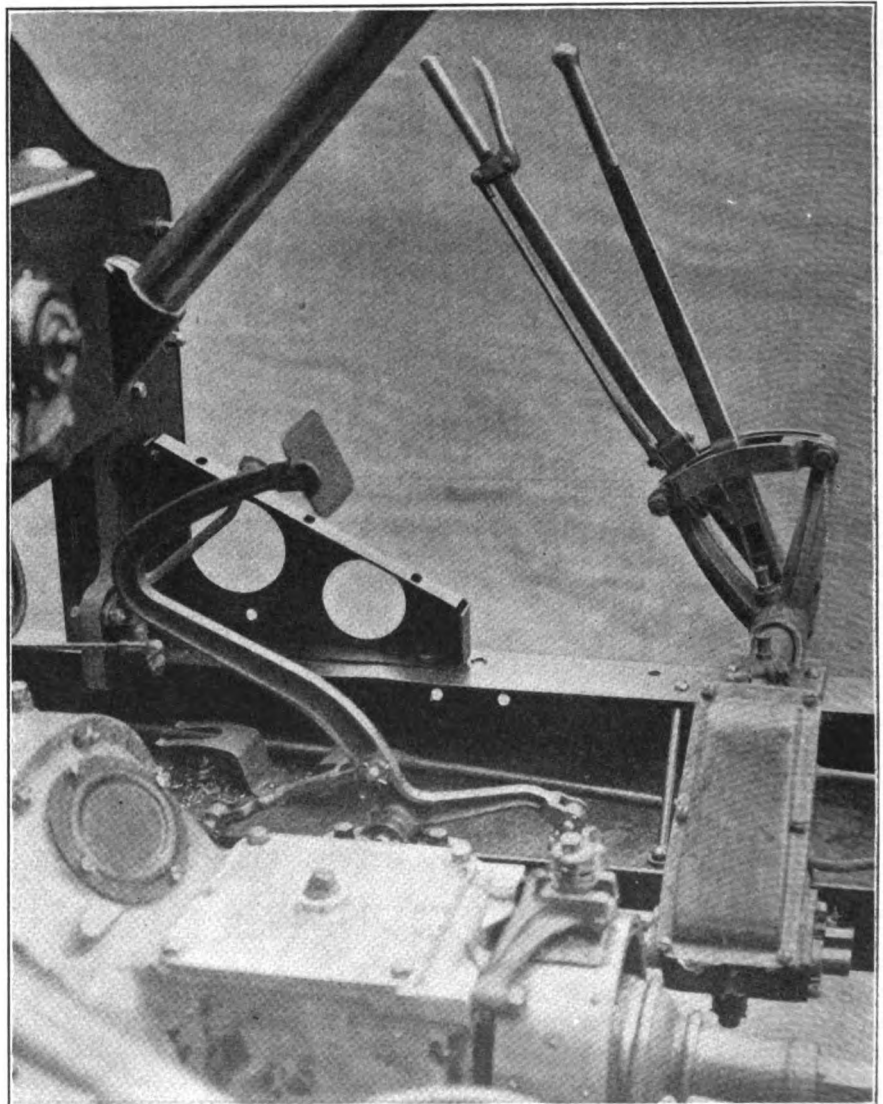
When placing a jack under a car be careful to get the head of the jack under a part of the car that

can stand the strain. Don't attempt to lift the car by the truss rod or some part of the steering gear. In this connection let me warn against the purchase of cheap cast-iron jacks. They are easily broken, and may break some day when your life is depending on them.

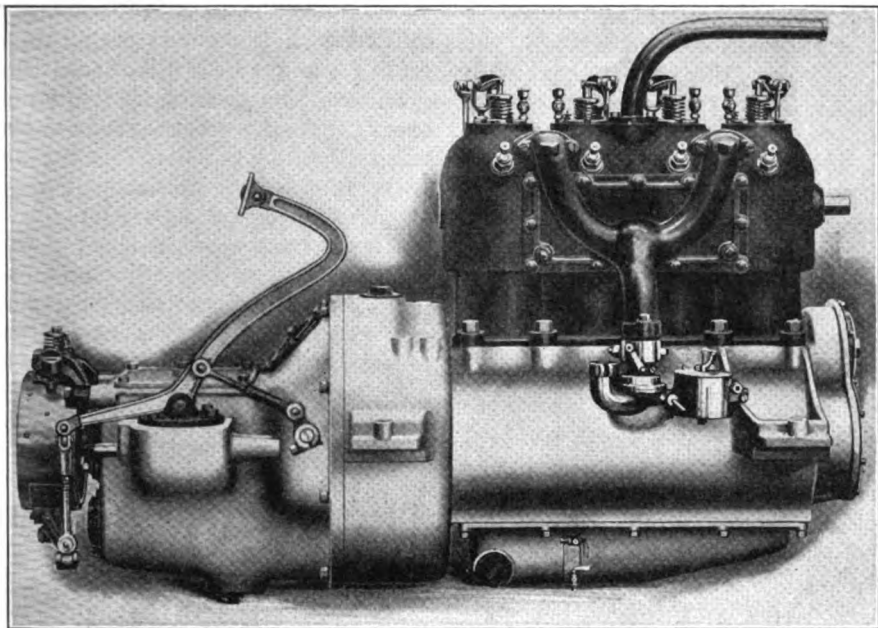
A thick, soft brush such as painters use is an excellent means of dislodging dust and dirt from the engine and some other parts of the car mechanism. Cotton waste is very ineffective among the pins and small projections of a motor, while the brush will do the work efficiently and save much bad language.

When cleaning up the points of spark plugs don't attempt to scrape them clean. Use an old stiff toothbrush, well saturated with gasoline.

When bolting down a cylinder, or any other part secured by more



A GLANCE UNDER THE FOOT BOARDS SHOWING THE GEAR SHIFT MECHANISM, THE TRANSMISSION CASE AND THE PEDAL FOR BOTH CLUTCH AND BRAKE



THE POWER PLANT FROM THE INTAKE SIDE SHOWING THE CARBURETOR AND THE SINGLE PEDAL FOR CLUTCH AND BRAKE

than one bolt, do not tighten one nut at a time, but give each nut a turn in time until all are snug.

Asked what was the first and greatest requirement in a general smith when starting to handle auto-repairing, a prominent automobile engineer said: "Common horse sense—it will go farther toward properly equipping him for automobile work than any one other thing. In fact, common horse sense coupled with the smith's natural mechanical ability makes him a better automobile mechanic than many of the so-called experts."

Coal as Fuel for Automobiles

VICTOR HART
(Horseless Age)

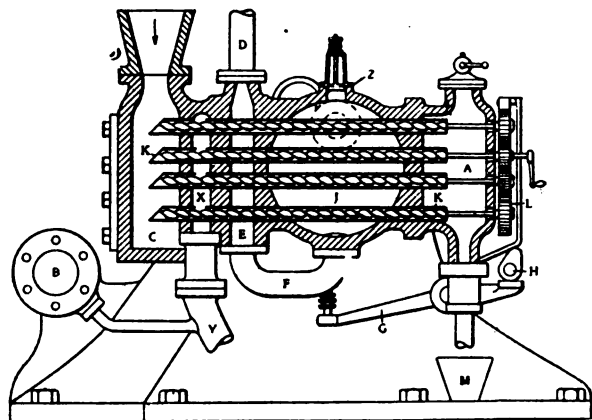
When the German inventor, Herr Diesel, introduced his high compression engine (wherein air only is compressed to 800 pounds to the square inch, crude oil being injected at the top of the stroke and ignited automatically from the heat generated by the high compression) he had great difficulty in persuading engineers that his engine could run on almost any sort of substance capable of an explosive effect when mixed with air. In order to demonstrate economical possibilities, Diesel showed conclusively that his engine would work just as well with fine coal dust as with crude oil, and without any risk of cylinder scoring,

because of the practically complete combustion which his system insures. The enormous weight of the Diesel engine has always debarred its application to automobiles, and although the problem has received close attention from many inventors its solution has not yet been reached.

A. M. Low, a young English engineer, has now gone a step further by not only designing but building an 80-100 horsepower single cylinder horizontal gas engine of the ordinary Otto four stroke type which actually drives itself by the burning of coal. Producers of the self-contained type for manufacturing gas from coal (through the medium of the piston suction when the engine is running) have been employed for several years as a part of the equipment for gas engines in districts where no central gas works are available or for large gas engines that could only compete with steam if driven at cheap fuel costs. In the Low engine the whole of the usual suction producer plant is eliminated, and instead an extremely simple set of additional parts enable the engine to be directly driven with coal fuel. This is such a departure from previous practice and seems so revolutionary that although at the time of writing this Low engine has only been demonstrated for some two or three weeks, it is already arousing keen interest among automobile and other engineers. Mr. Low has been working on the subject for seven years and has successively

overcome so many difficulties as to make him confident that the propulsion of automobiles with coal fuel for internal combustion engines—the gas produced by the engine itself when running—is within sight. To prove that his ideas were right he built a very small single cylinder horizontal engine in the autumn of 1910 and invited a few technical experts to see the little affair—it only developed about 2 horsepower—drive itself directly from gas produced from coal, the latter supplied in fine grains not larger than sugar crystals. Satisfied with the results from this model, a full size horizontal engine—cylinder dimension, 400 mm. bore by 625 mm. stroke—was then built, and on the last day of August was given a three hours' continuous run in London. The engine is intended to develop 100 horsepower, but on the occasion mentioned no attempt was made to secure a maximum number of revolutions, this trial run being solely contrived to prove: (1) that it would really run and feed itself directly with gas derived from small pieces of coal below 2 inches diameter; (2) that when developing 30 horsepower (shown by a Pony brake test) the coal consumption was 15 pounds per hour, or at the rate of one half pound of fuel per brake horsepower hour; (3) that although no "scrubbers" are employed to purify the gas, and only ordinary precautions are taken to prevent entry of coal dust to the cylinder, no tarry residue was discernible on the piston top, cylinder walls or cylinder head. Apart from the novel means for producing and utilizing coal gas in an internal combustion engine, the extraordinary feature of the Low patent is the very small fuel consumption; and when some minor alterations are effected it is hoped to reduce fuel costs still more. The quality of the coal does not seem to make any difference in the running, provided it is free from slate; and, so far as is at present known, bituminous and non-bituminous coal gives equally good results.

The inventor is now working out plans for an automobile engine of 20 horsepower, with either an ordinary four cylinder vertical or a two cylinder "V" with cylinders at a 90-degree angle. In another direction he has already produced a gasoline engine with two cylinders, each



DIAGRAMMATIC SKETCH SHOWING THE DISPOSITION OF THE PARTS OF THE COAL BURNING MOTOR

having a 60 mm. bore and 60 mm. stroke, which, compared with other engines, ought only to be able to give off about 4 horsepower. However, he has demonstrated that it will develop 18 horsepower; and fitted to a machine of the motorcycle type has propelled driver and passenger at a speed of 51 m. p. h. on the road. He attains such an abnormal result by circulating the petrol around the cylinder heads; the heat raising the petrol to boiling point, prior to admixture with air and admission to the cylinders. Mr. Low contends that most of the heat now wasted at the radiating flanges of air cooled cylinders or at the jackets of water cooled cylinders can be utilized for increasing power. This employment of waste heat is the principle relied upon in the coal fuel engine.

With the exception of the rear of the cylinder head the whole of the engine is built similarly to any ordinary gas engine. The diagrammatic sketch shows the disposition of the parts. On the left is the coal box C, and next to it is a gas chamber X. Then comes an exhaust gas chamber E connected to the cylinder J by the exhaust pipe F, the exhaust chamber E having an outlet pipe D to the muffler. To the right of the cylinder J is the ash box A, which leads down through an open-ended pipe to the ash pit M. Below and to the right of the ash box A is the camshaft H, which by means of the rocker arm G lifts from below the exhaust valve that passes up through the exhaust pipe F. The mechanically operated inlet valve is actuated off the camshaft at Z by a long toggle jointed shaft, that extends at an angle at the side of the cylinder head. Just below the coal box C is a cast-iron box B

containing two rubber bags connected to the gas supply pipe Y with a small diameter bypass tube, the rubber bags in B acting as a balancer for the gas between each power stroke and keeping the supply at an even pressure. Superposed in the coal box C are four cold drawn steel tubes K, which extend through the gas chamber X, through the exhaust gas chamber E, through the cylinder head J and into the ash box A. These tubes are open at each end, and where they pass through the exhaust chamber X are pierced with a number of small holes at the top. On the right of the ash box A are four intermeshing spur wheels L, driven off the camshaft H by ratchets, each spur wheel rotating shafts which pass through the tubes K. On these shafts are mounted sharply pitched worms which, when the engine is running, so turn that they constantly convey from left to right. The small handle shown to the right of the spur wheel is for rotating these shafts by hand before enough heat is evolved by the engine for sequence of operations.

Coal is led down the chute into the box C, the conveyor worms in tubes K then drawing it along slowly, and as it successively passes through the exhaust chamber E and cylinder head J the heat from these two raises the coal to incandescence, and gas is evolved. The waste ash is forced by the worms into the ash box A and falls straight down through the vertical pipe into the ash pit M. Air to form the explosive mixture is drawn by the piston suction up through the open-ended ash pipe, passes over the incandescent coal in the tubes K, reaches the gas chamber X, passes through the holes in the tops of the tubes at that chamber and thence passes via the gas supply pipe Y to the inlet valve Z.

Referring to the sketch, there will be observed a small arched tube behind the inlet valve. This tube is connected up through a water tank and a valve at one end and to the gas supply pipe at the other end, and is intended to deliver a hand regu-

lated number of drops of water per minute, with the object of partially cooling the gas before it reaches the cylinder. The heat of the latter, of course, instantly creates water vapor when it enters. An additional air valve (not shown in the sketch) is attached to the gas supply pipe close up to the inlet valve, it being of the automatic type and adjustable by hand from the exterior. Ordinary coal gas from the town main is at present used for starting up the engine until the cylinder head sufficiently heats the tubes of the conveyor worms.

The Care, Repair and Operation of the Automobile-3

(With Special Reference to Overland Cars)

Motor Lubrication

The lubrication of motors is partly by splash and partly mechanical. The crankshaft bearings and the connecting-rod bearings are kept lubricated with oil splashed into them by the lower ends of the connecting rods dipping into the oil contained in the bottom of the crankcase (see Fig. 1).

While this splash takes care of the lower bearings, uniform cylinder lubrication is secured by means of oil forced between each cylinder and piston set from a mechanical lubricator which will later be described in detail and illustrated.

Three oil grooves in the piston carry the oil around and up and down the cylinder walls.

The wrist-pin is lubricated from the cylinder walls through the opening in the piston through which the wrist-pin is inserted, as well as

(Copyrighted by Willys-Overland Co.)

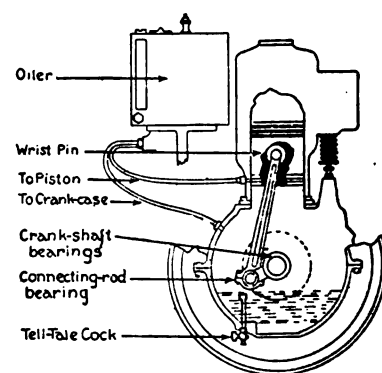


FIG. 1—HOW THE BEARINGS ARE LUBRICATED

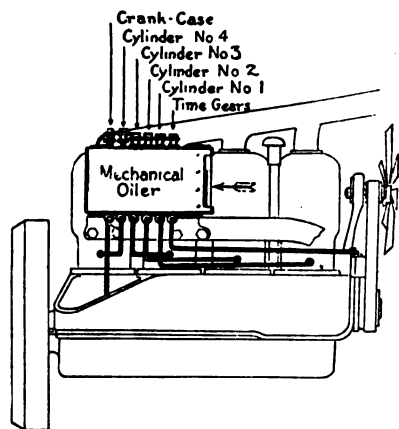


FIG. 2—MECHANICAL OILER AND HOW THE OIL IS DISTRIBUTED

through an opening cut in the connecting rod over the wrist-pin bushing.

The oiling system is of very simple design (Fig. 2), and the only place where adjustment may be required is the mechanical oiler. As long as crankcase and mechanical oiler are supplied, motor lubrication will be ample.

Once in every thousand miles running, the crankcase should be drained and washed out with kerosene poured into the breather pipes. For drainage, two plugs are provided; one under each of the crankcase compartments. After flushing with kerosene, replace the plugs and fill the two compartments with five pints of fresh lubricant.

For motor lubrication, use a light cylinder oil, free from carbon and having a flash-point of not lower than 425 and a fire-point of not less than 475° Fahrenheit. The flash-point of an oil is the temperature at which heated oil will give off inflammable vapor, while the fire-point is the temperature at which the oil will burn steadily on the application of a flame. Avoid oils that have nothing but their price to commend them. Money spent on good oil is excellent motor economy.

Adjusting Mechanical Oiler

The oiler (Fig. 3) is set before the car leaves the factory, and no adjustment is necessary until the car has run about five hundred miles. By that time all moving parts have attained that glass-like finish which comes only from work, and then the oil supply may be cut down slightly.

To increase the quantity of oil forced to each cylinder, to the gears

or to the crankcase, it is only necessary to loosen the lock-nut, screw the adjusting nut up or outward, which allows the yoke to move the plunger lower into the cylinder, thereby forcing a greater quantity of oil past the check plunger and into the feed tube leading to the engine.

To decrease the quantity of oil, screw the adjusting nut down, thereby shortening the stroke of the plunger and cutting down the amount of oil forced past the check plunger.

If a clogging of the feed tube should occur it will be indicated by the plunger or plungers remaining up. To remove such obstruction in the tubes, the plunger may be forced up and down by hand.

The frequent examining and re-filling of the crankcase may be largely avoided by the owner, who by a little experimenting can adjust the oil supply from the mechanical oiler of the crankcase so that the consumption will be offset by the rate of flow from the oiler.

The Splash System

Some motors are lubricated entirely by splash. The oil reservoir located in the bottom of the crankcase is filled through the breather-pipe, the level being shown by a red ball in the oil gauge at the side of the motor (Fig. 4).

This oiling system is automatic and self-contained and requires no other attention than an occasional filling—once every 400 miles—of the crankcase.

The simple working of this oiling method is shown in Fig. 4. The pump is driven from the camshaft. The oil is drawn from the "sump" or lowest portion of the crankcase, and after passing through a gauze screen it is raised to a sight-feed on the dash, whence it runs into the troughs and against a spreader which divides the stream of oil coming from the pump, one half going to the front troughs and the other to the rear troughs, while surplus oil drops back into the base compartment through overflow slots.

Care should be taken in re-assembling to center the oil pipe against this spreader. Small scoops fastened to the lower ends of the connecting-rods splash the oil into crankshaft bearings, connecting-rod bearings and wrist-pin bearings as well as against the cylinder walls. The splash scoops

are carefully set and they should not be disturbed.

The gears in front of the motor are kept lubricated by oil splashed into the gear housing from the main case, and the oil is returned to the base through an opening in the front bearing cap.

About every thousand miles, drain off the oil and wash the crankcase with kerosene, which should be drawn off through the large drain plug. Then refill with two gallons of high-grade cylinder oil and replenish the supply whenever the float gauge indicates the necessity for doing so.

A most commendable precaution is to strain every drop of lubricant you put into your motor-oiling system.

General Lubrication

The lubrication of an automobile is not a cumbersome thing and resolves itself into the truth that the car must be lubricated when it needs it—not when the owner or operator happens to think of it.

A point worth bearing in mind is that an oil suitable for one particular engine is not necessarily the proper lubricant for another motor of different make or power rating or which may have an oiling system that does not lend itself readily to the use of a different oil.

Oil manufacturers produce gas-engine lubricant of three different

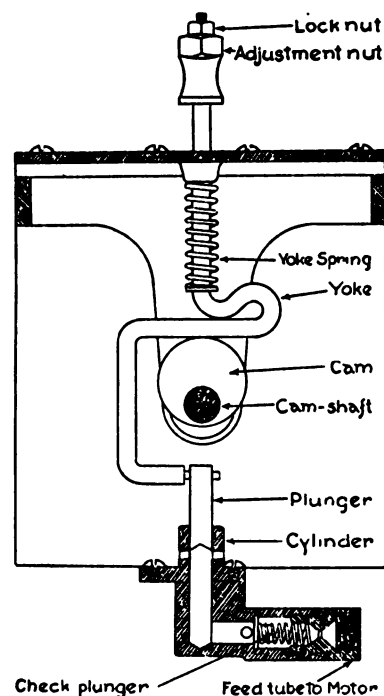


FIG. 3—HOW THE FORCE-FEED OILER OPERATES



consistencies—heavy, medium and light. The proper one to use in Overland cars is medium.

The conditions under which the advices as to oiling will be found reliable are those of ordinary touring; say, one hundred miles a day.

At least in the beginning of the new owner's career as a motorist he should consult the chart daily, even though his mileage be comparatively low. He should at least go over the chart and ask himself whether any one of the points indicated requires attention. The instructions: "oil daily," "oil monthly," etc., do not necessarily mean that the supply of lubricant must be renewed. According to circumstances, supply fresh lubricant, turn down grease cups or

become dry. Therefore it is good practice to inject a little oil through the cups which will keep the grease soft.

Brakes

Few motorists think of lubricating their brake connections, though many of them who are obliged to have the brake linings renewed find the hinges so rusted that they have to be sawed apart. Mud and water find their way readily to the brakes in spite of the protection provided by the designer. A squeeze of the oil-can and a drop of lubricant given daily in passing around the car will do wonders here.

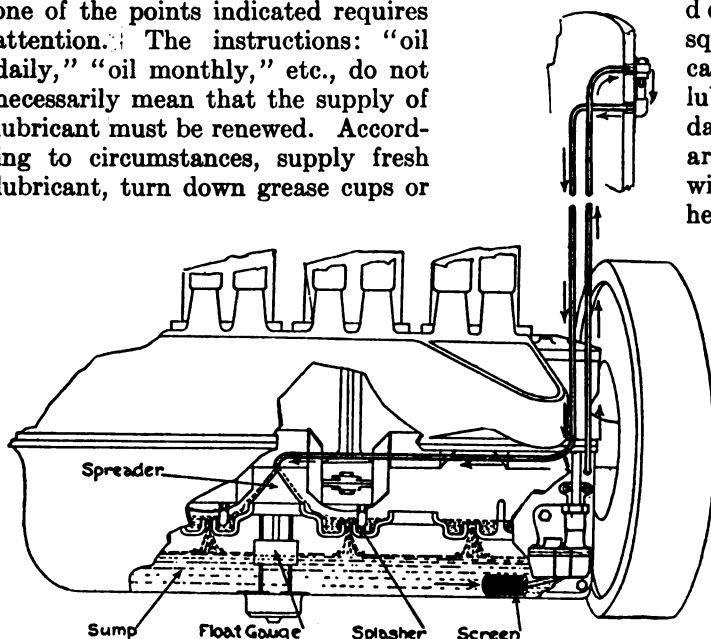


FIG. 4—HOW THE OIL IS MADE TO LUBRICATE

supply oil to oil holes. At any rate use the chart in the beginning until you have formed the habit of knowing just when and where to oil.

Steering Mechanism

As will be seen from the chart, the steering connections have been profusely dotted with instructions, "oil daily." No part of the automobile is more vital than the mechanism used in controlling the car's direction. Lack of lubrication in the engine may stop the motor or interrupt the flow of power to the driving means, but failure of the steering apparatus is a dangerous thing, and a few drops of oil given to the oil cups and the various steering connections constitute a cheap and safe insurance against the possibility of an accident. Particular attention should also be given to the two oil cups on the steering worm and gear.

Worm and gear are packed with grease which, having no outlet, will remain. However, with continued use of the car the grease is apt to

Fan

An item not shown on the lubricating chart, but needing regular lubrication, is the fan under the hood, the pulleys of which should receive a weekly application of oil. This is necessary, because the fan, in the nature of things, is exposed to the dust of the road.

Fan Adjustment

When the leather belt of the fan has become stretched through considerable use it may be tightened at the eccentric shown in Fig. 5.

Lubricating the Springs

Even the best-designed spring will become squeaky as soon as moisture enters between the leaves and causes rust.

The best way to lubricate the springs is to lift the car by placing a jack under the body (not under the axle). This may be accomplished with the help of a block of wood as shown in Fig. 6. The weight of the wheels and axles will pull the spring

leaves apart so that it is possible to spread some graphite grease between them. Graphite grease is to be preferred, because the graphite will remain between the leaves and continue to act as a lubricant long after the grease itself has become dry.

A spring treated in this way will not require lubrication again for a long time.

The spring bolts are kept lubricated by means of grease cups which should be turned down occasionally and refilled when necessary. Keep the bolts tightened.

Universal Joint

The universal joint is a flexible coupling between clutch and propeller shaft, and its purpose is to compensate the otherwise imperceptible twistings of the frame, which

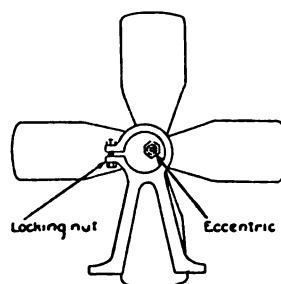


FIG. 5—WHEN THE FAN BELT STRETCHES, THE ECCENTRIC SHOULD BE ADJUSTED

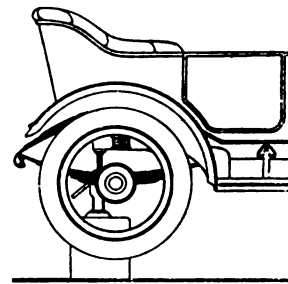


FIG. 6—JACK UP THE CAR TO GREASE THE SPRING LEAVES

without the use of the coupling would get out of line sufficient to prevent smooth working. The universal joint is fully enclosed in a leather boot filled with hard grease and should be kept supplied by frequent refilling and screwing down of the universal grease cups.

(To be continued)

The Valves of the Automobile Engine

Their Timing and Adjustment, Their Efficiency and Seating, Their Springs and Stems

H. B. CHURCHILL

Valve Timing

This is a matter of considerable importance, as the timing of the valves and the condition of their seats has much to do with the power developed by the engine. The valves of an automobile engine are accurately timed at the factory, and the necessity of re-timing usually occurs as a result of wear in the valve seats,

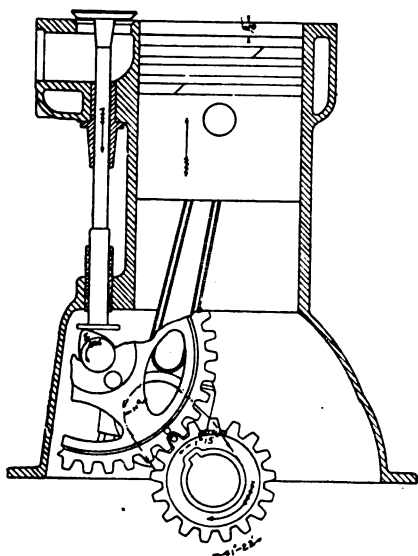


FIG. 1—SHOWING POSITION OF EXHAUST CAM, EXHAUST VALVE, CRANK CONNECTING ROD AND PISTON OF FIRST CYLINDER WHEN MARKED TOOTH AND SPACE ON TIME GEARS ARE ENGAGED

valve stems, push rods and time gears after the car has been in service for a year or more. If the cam shaft is removed for any reason, care must be taken to replace it so that the tooth of the small time gear, indicated by a punch mark, will mesh between the two teeth of the large time gear, at the zero mark. In assembling the cam shaft to the large time gear see that the first exhaust cam point is in the opposite direction from the zero mark on the gear. The diagrams, Fig. 1 and Fig. 2, will show the proper setting of the valves and also the time gears.

When valves or valve lifters become worn so as to leave unusual play between them, thus reducing the lift of the valves and diminishing the power of the motor, one of two things should be done; either replace the push rods with new ones or draw the valve stems out until there is a space of about 1-32 inch between them and the push rods. In drawing out the valve stem, extreme care must be exercised not to bend it, as this will cause the valve to stick or to wear the seat and guide unevenly. The clearance between the push rod and valve stem should never be greater than 1-32 nor less than 1-64 of an inch. If the clearance is greater, the valve will open late and close early, resulting in uneven running of the motor. If the clearance is less than 1-64 inch there is danger of the valve remaining partially open all the time. If the clearance be too great, the valve

stem may be drawn out; if the valve stem is drawn out too much it may be cut off.

Three fourths inch of the valve stem just above the cotter pin hole does not enter the valve guide. Always draw the valve out at this point.

Valve Springs

When the valves fail to seat themselves promptly, the springs may be weak and should be looked after. A weak inlet valve spring makes itself evident by back-firing through the carburetor. A broken inlet valve spring pin will give much the same indication.

Valve Grinding

Valves should be ground at regular intervals—whether they leak or not. The grinding of the seats will cause them to set accurately and prevent uneven wear of the guides and consequent leaks past the valve stems—a condition which results in loss of power and unevenness in the running of the motor.

Leaky valves make themselves manifest by loss of compression, easily discoverable in cranking the engine.

For grinding purposes either ground glass or fine emery is commonly used. A convenient way is to put a small amount of emery in a suitable dish, adding a spoonful or two of kerosene and a few drops of lubricating oil to make a thin paste. Place the mixture on the bevel face of the valve, put the valve in position and rotate it back and forth (about a quarter turn) a few times, then lift slightly from the seat to change the position of the valve and continue the operation until the bearing surface is smooth and bright. The valve should not be turned through a complete rotation, as it is apt to cause scratches

running around the entire circumference. When completed, the valve should be removed from the cylinder, thoroughly washed with kerosene and the valve seat wiped out thoroughly clean. Extreme care should be taken that no abrasive substance gets into the cylinders. If the valve seat in the cylinder is ridged or in bad shape it is best to re-trim the seat with a valve seating tool. This operation requires considerable skill, and care should be exercised against making too deep a cut, necessitating the re-trimming of the valve.

Floating the Sinking Fund

By THORNTON

Part I

"I'm doing plenty of business—working like all-do-tell—but I ain't making any money."

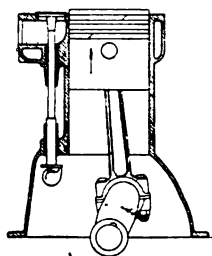
Did you ever hear that—read it—say it?

If you are a blacksmith and have been in business for any number of years you have not only heard it, but you, yourself, have said it.

Now, get ready for a big fact that is going to put such a big crimp in your egotism that you'll be ashamed to walk on the same side of the street with yourself.

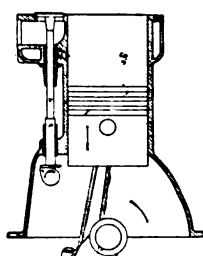
You see (this is a little whisper on the side) the Editor said: "Thornton, I want something from you that will make our readers sit right up and take notice of their business faults. You can do it, and I want you to make it strong." So there you are, and—to get back to my story—here's the fact:

More than half of the blacksmith shops in these gr-r-eat and glor-ri-ous United States are not paying a



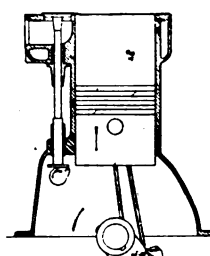
INLET VALVE OPENS

Inlet valve opens $\frac{1}{8}$ (piston travel) past top center on first stroke.



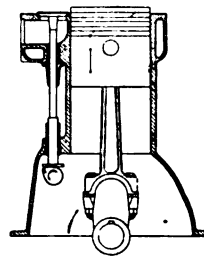
INLET VALVE CLOSSES

Inlet valve closes $\frac{1}{4}$ past lower center on second stroke.



EXHAUST VALVE OPENS

Exhaust valve opens $\frac{1}{4}$ before lower center on third stroke.



EXHAUST VALVE CLOSSES

Exhaust valve closes on top center of the fourth stroke.



profit—and they do well if they pay a living.

Do you doubt or question that statement, Mr. Reader?

In most of the shops you will find if you talk to the smith that while Hope was a regular hanger-on in the shop during the first year or two she has either said, "Goodbye", or is putting on her wraps ready to go. And if Hope has departed, you will

That is what I did at the time this story starts. I didn't call the sheriff, but he came along, nevertheless, and took charge of things.

It nearly laid me out flat, and for the entire count. When I began to recover, I took stock of things, and there was about as much left of my business and possessions as would go on the head of a number five nail. Of course I had my trade left—

smith then employed in a general smithshop. The evenings—the time between supper and bedtime—were what had the greater bearing on later developments.

First, these evenings were devoted to a careful review of why my first business venture was such a successful failure. Sometimes I had to ask men in other businesses for the answer. But I stuck to it like flies to a horse in August. There were old business methods that had been so welded to smithing and the smithshop that it was like pulling down the force to change them.

For example: Since Tubal Cain first began heating iron in a forge—since any man has done smith work for his brother man and charged for that work—it has been considered proper and correct to add to the cost of the material used a few cents for fuel and a dime or two for profit. The result was the figure the smith charged for the work.

Another bit of system that was considered good enough for the smithshop was the old practice of charging everything on your memory and then transferring it to the book or slate at night—and some smiths did not even have books in which to enter their charges.

And those business smiths who did business with a set of books usually waited until the end of the year to find out whether they were doing business at a loss or at a profit.

These methods, with several others, were exploded good and proper in talking with business men in other lines. I couldn't see why some of the modern methods used in other lines could not be grabbed by a blacksmith and adapted to his business. And one of the important system stunts of the modern business man, and the one that appealed to me most, was the one of not waiting twelve months to find out whether you are making a profit. To quote the old, tried-but-true "the time to strike the iron is while the iron is hot". And the time to grab profits is while the grabbing is good—while the profits are being made.

If you had a barrel of oil in your store-room and the barrel was leaking, would you want to know it today or a year from now? And if you waited until the end of the year what chance would you have of stopping the leak and loss?



Apologies to Imp. Trade Journal

DON'T FORGET TO SEND US ONE—THE SHOP NUMBER IS NOW BEING PREPARED

usually find that the smith is simply working day by day, and looking, watching and expecting something to happen that will by some magic put him on Easy Street.

How do I know?

Am I not a blacksmith? Have I not had the same experiences? I've stood in the doorway and have watched Hope go on down the road and disappear entirely at the turn where my biggest competitor's shop stood.

And when Hope has departed, a fellow feels just about sick enough to call an undertaker.

that couldn't be taken away from me—and I knew after looking things over and thoroughly digging into matters that everything depended on that trade—general smithing.

I had to do something and do it pretty quick if I didn't want to see my family go over the hill to the poorhouse. The best thing to do, and also the thing that would bring in the quickest returns, was to get a job—and I did; and for several years I worked during the day and planned during the evenings.

Never mind about the day work—that was much like the work of every



Now take the business proposition—take this matter of profit and loss and waiting until the end of the year before you know where you are at. Suppose you find upon looking over the books after you have had your New Year's dinner that, while January and February were fairly profitable months, March weather conditions were such as to eat up about all the profit made in the two previous months. Now suppose, instead of waiting until January first to find that out, you had kept such records of your business as would enable you to know about the loss when the loss was occurring—the chances are that you would have stopped it. The chances are that you would have at least pushed business up so as to get an even break instead of feeding the profits of the two previous months to keep you going during March.

You know there are a lot of smiths who seem to think that when they have made enough to feed themselves and their families three times a day and have sent their children to the local school they have done all that can be expected of them in the blacksmith business.

There is no reason for that thought being prominent in the average smith's mind, for money can be made in this business. I know it can, because I have made some—and am making some now.

After the sheriff took charge and after I had "jobbed" for several years and put in my evenings planning and scheming on the future I concluded that it was about time for me to get back into the harness again. I had a little money saved for just that purpose, and it didn't take me very long to get started.

And I started with one great big idea firmly and soundly planted in my thinking apparatus. That idea was, is now and always will be, this: IT IS WHAT A MAN GETS OUT OF HIS BUSINESS THAT IS WORTH ANYTHING TO HIM AND HIS FAMILY.

(To be continued)

An Excellent Piece of Advertising Matter

Piece after piece of advertising matter has come to our desk from shops in all sections of the country, and some excellent matter, too, but the "stunt" that we believe takes the prize is the recent one of Fred.

Correll, up in Illinois. We have been getting examples of the Correll Shop advertising for several years, now, and judging from the matter they send out—both the quantity and quality—they must be pretty busy.

This latest piece of advertising matter is a copy of Farmers' Bulletin No. 179 of the Department of Agriculture. This bulletin on horseshoeing is an excellent treatise on the subject, by John W. Adams.

Upon the back of copies of this bulletin the Correll shoeing department was advertised as follows, in a letter:

DEAR SIR: To introduce myself, let me state that "me name is Barney Barton, I'm 44 years old, and Irish."

I've been shoeing horses for thirty years from Maine to California,—and—incidentally—during the twelve years that I was First Farrier's Sergeant in the Seventh Cavalry I have shod the horses belonging to the officers of that regiment in a few foreign countries.

I know that I know how to shoe them, and you'll know that I know how to shoe them, if you'll bring up your team and give me a chance to prove it to you.

Fred tells me that you not only have a nice team to shoe, but that you're a good square fellow,—the kind of a man that both he and I like to work for. And that's the reason, my friend, that I'm sending you this little book on shoeing, and asking you to come up and get acquainted.

Because,—
If I knew you and you knew me,
I'm sure that we'd about agree.
And after we'd clasped each other's hands
Each one of us would understand
That both intend to do what's right,
And treat each other "honor bright."
So, come to the CORRELLSHOP, and see,
And I'll know you and you'll know me.

Very truly yours,
BARNEY BARTON.



The Solution.

If your business is not growing, it is dying. It cannot stand still. You may think it can, but it is impossible. And this question of growing or dying is the difference between making profits and making losses. That is all there is to it. If you are making

profits—and I mean making them in the right way—you are growing, and will grow. But if you are making losses, you are surely dying in a business way.

Now the Solution:

The Solution for giving and getting proportionately for the dollar.

The Solution to the question, "How's Business?"

The Solution and difference between "Guess-Work and Know-Work."

The Solution to the question of "Brains or Sawdust."

And lastly, the Solution to the problem "What Ails Business?"

"What shall I do?" is the question.

Work harder when I am already working too hard?

Put in more capital when I have already got all I can command?

Raise prices, when I am, according to my customers, already charging too much?

NO. The question cannot be solved in any such off-hand way.

We must fit the Solution to the Cause.

We cannot use a so-called cure-all. We must diagnose the case and then prescribe accordingly, just as a skilled physician does.

First of all, look upon your business as a stranger would. Forget that it is your business. Criticize it, find fault with it—to yourself, of course—and question the various business methods from the customer's standpoint. Ask yourself why and wherefore about your methods and policies.

When an opportunity presents itself, call on the smiths in neighboring towns. If you can make a little trip of several days to several towns, so much the better. Ask these smiths questions; ask them how they do this, that and the other thing. Take a little note-book with you, because you'll want to note down some of the ideas you receive in this way.

If you have time, talk to some of the customers of these smiths. Ask these customers why they trade with the smith. Ask these customers how they feel toward the smith's competitors and why they do not trade elsewhere.

Now question your own customers. Ask them similar questions. Question the customers of your competitors; find out why they trade where they do and why they do not trade at one or the other of the competing shops.

Talk to grocers, butchers, implement dealers, hardware men and other business men. Ask them questions about their businesses; ask them how they buy and sell; how they figure profits; how they treat slow payers and dead-beats; how they do the thousand and one other things in a business way.

Then—take your note-book and sum up the investigation. Consider each point you have touched on—consider each point you have learned. Consider a certain condition and attempt to solve it. Apply the things you have learned to your own business. Fit the notes you have made into your own shop, your books, your business. Look at your business again as a stranger and with eyes wide open for the application of the better business methods you have learned, the shorter methods you have had explained, the business stunts you have seen.

Look at your business in a big, broad way—look at it as an investment which must be made to pay—look at it as an opportunity which you are going to carry to success.

An ant may blindly work its heart out, but it cannot make honey.

If you work intelligently and faithfully, Success Will Stare You in the Face.

NOTE—This is the last of a series of Talks by the Editor, on Business. The first appeared in the October number of 1912.



The Driver's Farewell to His Team

(With Apologies to Caroline E. F. Norton, the Author of "The Arab's Farewell to His Steed.")

I

My faithful beauties, true as steel, I grieve
that you and I,
True friends for many a long, long year,
at last must say "good-bye."
Times change, and fashions alter fast as new
succeeds the old—
They say we must keep up with times—
my steeds, you must be sold.

II

Farewell, old girl! Farewell, old boy, that
long I've groomed and fed,
You soon must quit the stable, here—by
stranger hands be led.
Some other touch, less fond than mine, shall
smooth your flank and side,
Some other voice, more harsh than mine,
your lagging steps shall chide.

III

Tomorrow's sun shall dawn and fade, but
never more with you
Shall I begin my daily work, because, old
friends, you're through.
No more we'll work in happiness, no more
we'll share our woe,
So let us share one last embrace ere from
these stalls you go.

IV

Yes, you must go—your stable here, this
welcome resting place,
Where oft I've stabled you so snug, no more
shall know your face;
And when in joyous dreams I hear your old
familiar neigh,
I must awake to find, alas, such joys have
passed away.

V

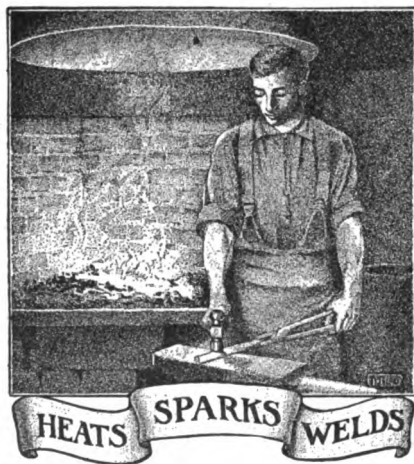
And when I grasp the wheel to drive that
puffing, chugging thing,
In fancy I will drive my steeds, with rein
and strap and ring;
And when at night I come within these
cheerless walls again,
I'll sadly muse upon the time when last I
held your rein.

VI

When last I held your rein! Ah, Fate!
That you should cause this pain.
That you should cause these steeds and I
to part for worldly gain—
And yet, while true, I scarce believe those
days have really fled.
If I may never drive again, I'd rather far
be dead!

VII

Who said I'd give you up, my steeds, who
said we three must part?
Tho' you've been sold, 'tis not mere gold
'twill heal a broken heart.
No! no! I'll never give you up! Who wants
the pair of you
Must show enough to buy us all and take
the driver, too.



One way to make collections good is to make them good.

If a horse will stand without hitching, is he a postgraduate?

Is an inventory necessary? Is it necessary to count your cash?

A small stock will do the work if you know instead of guess.

Are you getting more or less than the prices suggested and shown in this issue?

It's a no-'count smith who will let a no-'count customer run up a big account.

It costs more not to keep accurate records of your business than it does to keep them.

Poor jobs are very fond of the home roost. Usually it doesn't take them long to return.

Cuff Brasher says: "Wen it runs kind-a skimpy, lift yer feet—mebbe yer steppin' on the hose."

Treat your helpers as well as you do your best and most expensive machine; it saves depreciation.

When a man needs a thing in his business it is likely to cost more NOT to get it than the thing itself would cost.

Why should an honest smith make any bones about the fact that he is in an honest business for an honest profit?

Don't stow your ideas away in a safe to mould and rot. Keep them alive by passing them along for the good of the craft.

Seems as though old Hi Costofliving would be overcome with the burden he bears. But then, perhaps it is bending him double.

The man who wastes time over small things has little time to look after big things. Be an organizer—he's ahead of the hard worker every time.

There are lots of smiths who can't carry a tune across the street but who can play beautifully at the anvil to an accompaniment on the cash register.

Lots of troubles come down the road and pass right by our place when we pay no attention to them. Keep busy and you'll not have time for troubles.

You don't approve of the employee who knocks his employer—then why knock the craft that employs you? Boost the craft and the craft will boost you.

Success in anything, whether it is cutting hay, hair or iron, consists not so much in doing extraordinary stunts but in doing the common ordinary run of work well.

Business is a tank of profits. Capital is a pile of sponges. Put the sponges into the tank one at a time, and then take them out one at a time and squeeze them dry.

Every department of a big store must pay its proportion of light, rent, heat, etc. Are you feeding the profits of one department of your business to keep another alive?

You are known not so much by the business you are in, but by the goods you deliver—and if you can "deliver the goods" according to specifications you'll be well known, if you'll let the fact be known.

Look sharp to your opportunities. There are opportunities all around you if you will but look for them. Seek out those lines and channels along which to push your efforts, and success will stare you in the face.

Don't wait until a new competitor prods you into life. Make such a hot fight for business every minute that the new competitor will stay away. Keep everlastingly at it and success will stare you in the face.

Have you done any airship repairing? Some folks think they should be sent to the shipbuilder, but we say not—airships are vehicles of the air and should be repaired by a vehicle repairman. What say you?

Are you making the business articles pay you? If they don't make you think—if they don't make you sit up and look at your business methods with new eyes—you are not getting all you should out of them.

It takes a pretty big bank-account to support a pessimist. But, then, what's the use of being a pessimist if you've got a big bank account? And if you haven't a big b. a. you cannot afford to be a pessimist—so there you are.

Some smiths seem to think that to fold their arms and lean against the front door-sill, "kind o' graceful like," they will draw trade as a magnet does steel. Other smiths "jes' keep a-hammerin' an' a-hustlin'" while they're waiting.

Those fifty dollars are worth working for; and that watch is guaranteed—a seven-jeweled movement in a ten-year case. The fountain pen is made and guaranteed by a well-known maker of high-grade pens. Better get into that prize contest.

You can no more run your business on the money outstanding than you can build a shop on the foundation under your neighbor's house. If you've got a list of old accounts, make a big try at collecting. Clean up the old bills, get them off the books—get either the money or a clean, new start. And you'll feel more like pushing business hard. Try it.

Leaks rob you of part of the profit that rightly belongs to you; and the size of the leak indicates the amount of profit you are losing. If you discovered a leak in a barrel of oil you would, of course, stop it up. If you keep books accurately you can stop up the business leaks, because you'll know them the minute they occur. An accurate bookkeeping system is like a glaring, high-power searchlight that shows the way clearly and seeks out the pitfalls and snares. If your profits are leaking away, look to your business system.



Our Honor Roll

You Save Money

by taking advantage of Our Long-Time Rates, to say nothing about the time, trouble and annoyance you save yourself by subscribing for several years at one time.

It is easy now to get into the 1923 class. Suppose your account expires this month of March, 1913—just send in a remittance of \$5.00 (or \$7.00, if you live in Canada—£1, 14s. if you live in some other country), we will then mark your account paid to March, 1923, and your name will appear in the 1923 class in Our Honor Roll; and you will save five whole dollars (\$5.50 saved in Canada £1, 6s. in other countries).

Get into the 1923 class now before it gets crowded. Send in a ten-year order and save five dollars. You know a dollar saved is a dollar earned and you cannot earn five dollars easier or quicker, to say nothing of the good practical help you will get out of the paper.

	U. S. and	Mexico	Canada	Other
	Countries			
Two years.....	\$1.60	\$2.00	10 shillings	
Three years.....	2.00	2.70	14 shillings	
Four years.....	2.50	3.20	18 shillings	
Five years.....	3.00	3.75	1 pound	
Ten years.....	5.00	7.00	1 pound 14s.	

You can also gain a place on Our Honor Roll by getting new subscribers. Show this big list to your brother craftsmen. A paper must be pretty good to get a practical man's subscription years and years in advance. Send in the new subscriptions and we will give you six months' credit on your account for each new order. Will you tell your neighbor?

NAME	Subscription Paid to	NAME	Subscription Paid to
W. C. WATT, Kan.	Dec., 1930	P. J. DALLY, W. Aus.	Jan., 1918
I. J. STITES, N. J.	Jan., 1928	J. MORROW, Pa.	Jan., 1918
W. R. TURNER, Man.	Oct., 1923	J. G. JOHNSON, Ill.	Dec., 1917
T. BRADLEY, N. S. Wales	Mar., 1923	F. E. EGLERS, Ohio	Dec., 1917
G. C. DISINGER, Miss.	Feb., 1923	C. T. FORREST, Cal.	Dec., 1917
Z. A. ENOS, Kan.	Jan., 1923	THEO. BUSH, N. Y.	Dec., 1917
W. G. WISE, Cal.	Jan., 1923	J. T. ELLIOTT, Ill.	Dec., 1917
S. P. HARNET, Mont.	Dec., 1922	J. VOELPEL, Ill.	Dec., 1917
W. BREKNER, Okla.	Dec., 1922	W. J. MAIN, Cal.	Dec., 1917
L. O. LEIERS, Ill.	Nov., 1922	G. J. SAUER, Mo.	Dec., 1917
W. LAWSON, N. Z.	Nov., 1922	MESS BROS., Vict.	Dec., 1917
O. A. MORTIMORE, Idaho	Sept., 1922	E. BLOOMER, Aus.	Dec., 1917
H. J. WYATT, Wash.	Sept., 1922	F. R. TOMLINSON, Kan.	Nov., 1917
J. N. SKOW, Ia.	Sept., 1922	KAYE & AINLEY, Eng.	Nov., 1917
A. D. STANDFORD, Wash.	Sept., 1922	T. H. ZIEGLER, Wis.	Nov., 1917
T. TRAMKIEWICZ, Que.	Sept., 1922	SCHOLLER BROS., Ind.	Nov., 1917
A. PFELTHER, Ohio	Aug., 1922	E. M. WURSTER, Mich.	Nov., 1917
W. D. VALENTINE, Iowa	Aug., 1922	S. Z. FREY, Ind.	Nov., 1917
G. HOFFMAN, N. Y.	July, 1922	B. A. STEINKE, Ohio	Nov., 1917
J. ERMAN, Ark.	July, 1922	J. N. BATHGATE, N. Dak.	Nov., 1917
W. K. W. HANSEN, Pa.	June, 1922	J. DELAUS, Neb.	Oct., 1917
ROBERT TOCHTER, Cal.	June, 1922	GEO. POTSCHKE, Mo.	Oct., 1917
J. VAN MARTER, N. Y.	June, 1922	J. W. RAPS, N. Y.	Oct., 1917
E. ANDERS & SON, S. Aus.	May, 1922	W. C. RONEY, Pa.	Oct., 1917
LOUISA CARRIAGE WKS., Va.	May, 1922	J. N. MILES, Ky.	Oct., 1917
S. SMITH, Tex.	Apr., 1922	W. A. WILSON, N. Z.	Sept., 1917
J. W. HAAR, La.	Mar., 1922	R. ROSS, N. S. Wales	Sept., 1917
E. A. DILLON, Nev.	Mar., 1922	I. E. SPROUD, Me.	Sept., 1917
D. W. SMITH, R. I.	Mar., 1922	C. L. HOCKETT, Cal.	Aug., 1917
F. KUSTER, Wash.	Mar., 1922	H. C. STENZEL, Tex.	Aug., 1917
R. H. KEITE, Ia.	Jan., 1922	M. DELJAGER, S. Africa	Aug., 1917
O. M. JOHNSON, Minn.	Oct., 1921	F. HOWARD, Kan.	Aug., 1917
H. FELDUS, Neb.	Sept., 1921	H. FERREL, Ill.	Aug., 1917
W. K. KLINE, Kan.	May, 1921	J. MCMEKEN, N. Z.	Aug., 1917
T. P. CONBODINE, Mass.	Dec., 1920	F. H. GIERKE, S. Aus.	Aug., 1917
ED. GRIMM, Tex.	Mar., 1920	F. C. STONE, S. Africa	July, 1917
R. S. CRISLER, Ky.	Jan., 1920	H. J. DEVONSHIRE, N. Z.	July, 1917
I. M. TOWNSEND, Cal.	Apr., 1919	V. J. HUBBARD, N. Y.	July, 1917
G. BISH, Fiji Islands	Apr., 1919	W. R. GELLING, S. Africa	June, 1917
C. WILLIAMS, W. Aus.	Mar., 1919	J. H. BAKER, S. Africa	June, 1917
A. B. WENDLANDT, Wash.	Sept., 1918	A. R. HALLENBECK, N. Y.	June, 1917
A. J. BROCKMAN & Co., Vic.	Sept., 1918	F. C. BOCK, Neb.	June, 1917
PETER COCKS, W. Aus.	Sept., 1918	YOST & HALVORSON, Minn.	May, 1917
R. J. TOMPKINS, Tex.	Sept., 1918	W. MCCOY, Kan.	May, 1917
A. DISCHER, Aus.	Sept., 1918	A. GUBTLER, Tex.	May, 1917
WRIGHT & SON, Tex.	June, 1918	C. F. J. LORENZ, N. Y.	May, 1917
ALBERT MELLUM, N. D.	June, 1918	A. DATWYLER, Ohio	May, 1917
H. L. HASWELL, N. C.	May, 1918	H. G. MARRIOTT, Utah	Apr., 1917
B. COLVIN, Ind.	Apr., 1918	E. THIBAUDRAU, Wis.	Apr., 1917
J. B. JEFFRIES, Pa.	Apr., 1918	W. PICKERING, S. Africa	Apr., 1917
P. J. THORNEYCRAFT, N.W.T.	Mar., 1918	ED. BURROWS, England	Apr., 1917
J. C. YOUNG, Pa.	Mar., 1918	L. KAUSCH, Wis.	Apr., 1917
D. C. HOUCK, Ohio	Mar., 1918	J. M. BROWN, Tex.	Apr., 1917
RENTON WAGON WKS., Wash.	Feb., 1918	J. C. WOODS, W. Aus.	Mar., 1917
WHITTING Fdy. Equip. Co. Ill.	Feb., 1918	C. BOULTON, N. S. Wales	Mar., 1917
J. P. KOENIGS, S. Dak.	Feb., 1918	C. A. HAWKINS, Ore.	Mar., 1917
RICHARD BRENNER, Tex.	Feb., 1918	A. L. MONTGOMERY, W. Va.	Mar., 1917
W. F. HILL, N. C.	Feb., 1918	J. PETERSON, Ia.	Mar., 1917
D. C. FOLEY, Cal.	Jan., 1918	J. ANDERSON, Tas.	Mar., 1917
GLEASON BROS., La.	Jan., 1918	A. J. NEILL, Vt.	Mar., 1917
C. E. KRUG, Wis.	Jan., 1918	ED. DEITRICH, Ind.	Mar., 1917
G. E. WOODARD, Kan.	Jan., 1918	LEWIS CHASE, N. Y.	Mar., 1917
		E. O. LEE, S. Dak.	Mar., 1917
		S. STEMPLER, Ohio	Mar., 1917

NAME	Subscription Paid to	NAME	Subscription Paid to
R. S. GUGISBERG, Kan.	Mar., 1917	A. A. BAHLEKE, N. D.	July, 1916
J. S. HASKELL, Col.	Mar., 1917	ERNEST E. DOTT, Ohio	July, 1916
W. L. ROARK, Tex.	Mar., 1917	F. C. ASHTON, Pa.	July, 1916
A. R. BARLOW, Tex.	Mar., 1917	HENRY FISHER, Tas.	July, 1916
C. A. WHITACRE, Ohio	Mar., 1917	J. W. FOWLER, N. Z.	July, 1916
B. P. CARNET, Ill.	Mar., 1917	A. C. LODWIG, Cal.	July, 1916
T. J. DORSE, Conn.	Feb., 1917	J. K. HANSEN, Aus.	July, 1916
F. MARSH, Mich.	Feb., 1917	J. B. BARKER, Ill.	July, 1916
J. H. WHITE, N. H.	Feb., 1917	H. M. LARSEN, Wis.	July, 1916
McGOWAN BROS., N. Y.	Feb., 1917	GEO. P. MACINTYRE, Me.	July, 1916
W. H. SCHENE, Neb.	Feb., 1917	JAS. A. BUCHNER, Mich.	July, 1916
A. J. H. WEGENER, S. Africa	Feb., 1917	H. M. FINGAR, N. Y.	July, 1916
H. SCHNETTE, Ill.	Feb., 1917	L. H. STRANGE, Vict.	July, 1916
E. DOUGHERMAN, Ohio	Feb., 1917	P. O'DONNELL, Vict.	July, 1916
J. W. HAUGHT, Ill.	Feb., 1917	R. J. HANCOCK, N. Z.	July, 1916
CHAS. F. GIESE, N. Mex.	Feb., 1917	F. G. WILSON, Calif.	July, 1916
M. E. GOLLER, Pa.	Feb., 1917	I. H. HALL, Ind.	June, 1916
J. POTTHOFF, Neb.	Feb., 1917	F. FULTON, N. S.	June, 1916
M. E. GARRETT, Mich.	Feb., 1917	J. CHALMERS, S. Africa	June, 1916
ERNEST FINLEY, Pa.	Feb., 1917	G. R. HARRISON, Aus.	June, 1916
A. TILLMAN, Cal.	Feb., 1917	J. WATCICH, S. Africa	June, 1916
WALKER BROS., N. Z.	Feb., 1917	W. VOIGT, S. Africa	June, 1916
G. W. WHITTINGTON, W. Va.	Feb., 1917	MARTIN JENSEN, Wis.	June, 1916
J. H. HOYLE, S. Africa	Feb., 1917	CHESTER HUMBERT, Wis.	June, 1916
IRVING BROS., N. Y.	Feb., 1917	LINCOLN UNDERHILL, Cal.	June, 1916
F. ROSCHY, Pa.	Feb., 1917	M. BROTON, N. Dak.	June, 1916
AUGUST MILLET, Ill.	Feb., 1917	HANS ERIKSEN, N. S.	June, 1916
C. P. ROBERTSON, S. Africa	Feb., 1917	C. MORRELL, N. Brunswick	June, 1916
O. DANNEMAN, Minn.	Jan., 1917	J. O. CONRAD, Kan.	June, 1916
S. HETEM, S. Africa	Jan., 1917	ADAM SCHMITT, Mich.	June, 1916
G. A. GURLEY, Ore.	Jan., 1917	J. G. REEVES, S. Aus.	May, 1916
F. K. WADE, Me.	Jan., 1917	I. H. LUNDER, N. Dakota	May, 1916
L. V. SENN, Neb.	Jan., 1917	JAMES SINCLAIR, W. Aus.	May, 1916
S. H. AUSTIN, N. Y.	Jan., 1917	H. BAKER, Aus.	May, 1916
H. KAH, Ia.	Jan., 1917	E. Q. KREHBIEL, Kan.	May, 1916
J. H. BERGEN, Kan.	Jan., 1917	C. H. CAIRNS, N. Y.	May, 1916
F. G. A. WILLIAMS, S. Aus.	Jan., 1917	P. V. JOHNSON, Ohio	May, 1916
J. B. SCHEIDLER, Ind.	Dec., 1916	F. E. SMITH, Vt.	May, 1916
F. KUMMER, Ohio	Dec., 1916	C. A. STEBBINS, Kan.	May, 1916
ALFRED CASE, N. Z.	Dec., 1916	SANFORD BAKER, Mo.	May, 1916
H. GRIMM, Utah	Dec., 1916	E. B. ANDERBERG, Ill.	May, 1916
A. H. GOODING, S. Aus.	Dec., 1916	R. H. KUHN, Iowa	Apr., 1916
LEONARD SMITH, N. J.	Dec., 1916	WEIHA BROS., Ind.	Apr., 1916
C. F. SHAW, Man.	Dec., 1916	KELLIEH BROS., W. Aus.	Apr., 1916
W. EDWARD, Pa.	Dec., 1916	P. A. PETERSON, Ia.	Apr., 1916
W. W. EGY, Pa.	Dec., 1916	G. F. BOWERS, Okla.	Apr., 1916
JOS. BOYER, Mich.	Dec., 1916	D. E. McDONALD, Fla.	Apr., 1916
J. WILLIAMS, N. S. Wales	Dec., 1916	JAMES BAXTER, S. Africa	Apr., 1916
J. H. W. SCHNEIDER, Cal.	Dec., 1916	E. P. DIGNAN, S. Aus.	Apr., 1916
W. SAUER, Minn.	Dec., 1916	W. H. WINGET, Vt.	Apr., 1916
F. F. DARLING, Cal.	Dec., 1916	E. GRISE, Mich.	Mar., 1916
CHAS. NEWLAND, Cal.	Dec., 1916	GEO. TEMPEL, N. Y.	Mar., 1916
J. T. BRAHM, Ia.	Dec., 1916	G. W. BRYANT, Vt.	Mar., 1916
P. H. ST. LOUIS, Wis.	Dec., 1916	T. GAMESTER, N. H.	Mar., 1916
A. E. NICKOLA, Okla.	Dec., 1916	P. F. HONESTOGEN, N. Y.	Mar., 1916
C. J. HALL, Wash.	Dec., 1916	T. J. HARVEY, Ill.	Mar., 1916
BOB FRICKE, Ala.	Dec., 1916	W. E. HART, Okla.	Mar., 1916
JOERIS BROS., Tex.	Dec., 1916	C. SCHMID, Neb.	Mar., 1916
R. CLEMENS, Conn.	Dec., 1916	J. SHARPLES, N. J.	Mar., 1916
SCHIEFFELT & SCHMITT, Pa.	Dec., 1916	A. ROCKENSHUP & SON, La.	Mar., 1916
A. BRAUSE, Ohio	Dec., 1916	C. H. ALEXANDER, N. Y.	Mar., 1916
J. E. BEATTY, Mo.	Dec., 1916	A. M. HAREBO, Wis.	Mar., 1916
GEO. CASSIE, Scotland	Dec., 1916	GEORGE HOWARD, Kan.	Mar., 1916
JOHN KAIN, Ky.	Dec., 1916	G. N. FOULMAR, Neb.	Mar., 1916
F. W. HOWELL, Ill.	Dec., 1916	W. WILLOUGHBY, Mich.	Mar., 1916
H. A. CHEEVER, N. H.	Dec., 1916	H. HOFFMEYER, N. J.	Mar., 1916
W. M. GRIFFITHS, Aus.	Nov., 1916	FRANK L. LOCKE, N. Y.	Mar., 1916
W. B. TAYLOR & SON, Mo.	Nov., 1916	FRANK L. EVARTS, Conn.	Mar., 1916
G. WHITTEN, Mass.	Nov., 1916	C. R. WINGET, Vt.	Mar., 1916
J. M. VINCENTA, Wis.	Nov., 1916	H. J. CRISHOLM, N. Z.	Mar., 1916
TOM NOLAN, S. Aus.	Nov., 1916	C. F. MOKKENTEN, Aus.	Mar., 1916
H. J. FRENCH, N. Z.	Nov., 1916	H. D. PHILLIPS, S. Aus.	Mar., 1916
F. N. BROWNING & SON, Ky.	Nov., 1916	J. B. FAY, Wash.	Mar., 1916
J. MACUAB, Scotland	Nov., 1916	L. A. DOWNING, Cal.	Mar., 1916
J. GESSEN, Ill.	Nov., 1916	S. W. ELLIS, N. Y.	Feb., 1916
W. G. SIMB, S. Aus.	Nov., 1916	M. DUVOISIN, Ill.	Feb., 1916
H. V. RUEHL, Ala.	Nov., 1916	E. LAMPMAN, N. Y.	Feb., 1916
G. LINDBORG, Ind.	Nov., 1916	T. KROGER, Conn.	Feb., 1916
PITMAN STRELL, N. C.	Nov., 1916	W. H. NORTON, D. C.	Feb., 1916
C. V. FINKENBINE, Ind.	Nov., 1916	H. VALIERE, Quebec	Feb., 1916
C. W. WILSON, N. Y.	Nov., 1916	E. D. SATTERLEE, N. Y.	Feb., 1916
C. V. SCHMIDT, Cal.	Oct., 1916	A. C. DUNSTON, Mich.	Feb., 1916
T. J. MAUIRE, N. Y.	Oct., 1916	J. WHITTET, Kan.	Feb., 1916
A. W. WAITE, Cal.	Oct., 1916	TRAVERSE BAY, Mich.	Feb., 1916
C. W. ELLIS, Tex.	Oct., 1916	O. GUNDERSON, Minn.	Feb., 1916
J. P. SIMON, N. S. Wales	Oct., 1916	W. E. PEACOCK, N. J.	Feb., 1916
E. A. KNAPP, N. Z.	Oct., 1916	E. B. BUSICK, Ill.	Feb., 1916
T. J. HASKINS, N. S. W.	Oct., 1916	F. MEHLIN, La.	Feb., 1916
LOTHIAN & SKINNER, N.S.W.	Oct., 1916	J. W. HEPPLERWHITE, Ohio	Feb., 1916
W. B. KNOUFF, Ala.	Oct., 1916	A. A. SCHREIBER, Tex.	Feb., 1916
GORHAM BROS., Ia.	Oct., 1916	J. T. DILLARD, Tex.	Feb., 1916
W. H. F. BRAUCH, N. C.	Oct., 1916	F. J. FLESSEL, N. Y.	Feb., 1916
CLARK OLDS & Co., Neb.	Oct., 1916	E. P. JONES, Kan.	Feb., 1916
IRWIN SCOTT, N. Y.	Oct., 1916	E. J. BISHOP, N. Y.	Feb., 1916
C. E. DURHAM, Kan.	Oct., 1916	J. N. TYLER, Ohio	Feb., 1916
M. RINGO, S. Africa	Oct., 1916	T. BROWN, Conn.	Jan., 1916
W. DELLEY, Queens, Aus.	Oct., 1916	W. SMITH, Penn.	Jan., 1916
S. B. PHILLIPS, W. Va.	Sept., 1916	J. S. RUSH, Ohio	Jan., 1916
G. E. HARPER, Texas	Sept., 1916	E. W. MARTIN, Cal.	Jan., 1916
J. J. ILER, N. S. Wales	Sept., 1916	N. T. HOWARD Mo.	Jan., 1916
JAMES PORTGENT & Co., Mo.	Sept., 1916	H. L. WOLF, Pa.	Jan., 1916
JNO. GOETTINGER, Ia.	Sept., 1916	H. KREITZER, Pa.	Jan., 1916
GEO. FLECKENSTEIN, Cal.	Sept., 1916	A. MOSHER & SON, N. Y.	Jan., 1916
GEO. HILL, Aus.	Sept., 1916	F. HARLOW, Mass.	Jan., 1916
E. C. BEARD, Aus.	Sept., 1916	C. M. HANUM, Conn.	Jan., 1916
J. K. GLINICKI, Mich.	Sept., 1916	PETER COX, W. Aus.	Jan., 1916
OSCAR BUHNER, Md.	Sept., 1916	CHAS. H. KERN, Ill.	Jan., 1916
A. J. HAMMOND, Cal.	Sept., 1916	J. H. ECROYD, Cal.	Jan., 1916
ROBERT MURRAY, Cal.	Sept., 1916	THOMAS HORNE, Ariz.	Jan., 1916
D. E. WRIGHT, Pa.	Sept., 1916	CHARLES TUCKER, Mich.	Jan., 1916
J. S. HASKELL, Col.	Sept., 1916	M. KLITGORD, N. Y.	Jan., 1916
R. SOMMER, Aus.	Sept., 1916	O. STENNING, S. Dak.	Jan., 1916
J. A. SEQUIN, Can.	Aug., 1916	IVER JOHNSON ARMS AND	
JAMES CLARKE, Jr., Aus.	Aug., 1916	CYCLE WORKS, Mass.	Jan., 1916
DISPATCH Fdy. Ltd., N. Z.	Aug., 1916	FELDMAYER & SCHAAKE, Kan.	Jan., 1916



Ten Questions for the Month

The questions this month are on automobiles, and more particularly on the overhauling of a car. Naturally these questions will be a little beyond the novice, though it will be well for him to study the questions carefully and then to as carefully study the answers which will appear next month.

1. What facts should the mechanic have firmly fixed in his mind before beginning the work of overhauling a car?

2. Describe two devices that will aid materially in systematizing the work?

3. How may gear wheels, valve parts and other comparatively small parts be marked so as to make assembly into correct places and positions positive?

4. At what point is it best to begin overhauling when the entire car is to be overhauled?

5. What attention should be given the transmission?

6. How should universal joints be treated if showing wear?

7. What is meant by the stroke of the piston?

8. How may the lubricating system of a car be cleaned?

9. What should be done to the ignition system when overhauling a car?

10. Give a few hints on the assembling of a car.

Answers to Questions in February Issue

1. The paring chisel is long, rather thin, as compared to the other chisels, and is used for hand-work—it should never be used or driven with a mallet. The mortising chisel is a thick, heavy tool for use with a mallet and for cutting mortises, as the name implies. The coachmaker's chisel occupies a place midway between the other two and may be used both with the mallet and also as a paring tool. It is rather heavier than the true paring chisel, not quite so long, but it is broader and longer than the mortise cutting tool.

2. The try plane, also known as the smoothing plane, is used for finishing work to size. The jack plane is used primarily to remove

wood and roughly to get the piece into shape, so a finely set try plane can finish the work up quickly.

3. By the number of points it contains per inch. For example, a rip-saw for pine and soft wood is usually a $5\frac{1}{2}$ -point saw, i. e., its cutting edge has $5\frac{1}{2}$ teeth points to the inch.

4. A—a 5 or 6-point saw is fine enough. B—a 10 or 12-point saw is best.

5. If the hot glue is applied to a cold surface it is chilled and cannot penetrate the pores of the wood as it should. Heating or warming the surfaces prevents this chilling.

6. It depends upon the wood into which the wedges are to be driven. If the wood is hard, a wedge made of slightly softer wood should be used, because a wedge that is harder than the wood into which it is driven is very likely to be forced out when the wood is subjected to jar or vibration.

7. Occasional applications of linseed oil will keep the plane bottom smooth, clean and well polished.

8. No. A paring chisel should be applied with a diagonal stroke, so as to cut and shear the wood.

9. Apply a coating of chalk to the surfaces to be joined and then glue in the regular way.

10. Take dry white lead and mix it with equal parts of Japan and rubbing varnish. This is a good putty for general vehicle use.



Steel and Steel Working

F. KOPENHOEFER

With regard to the forging of high speed steel the weight of hammer and force of blows should be

considered with the size of tool being forged. As it is more dense than carbon steel it should never be worked at too low a heat. Re-heat frequently and keep it as near a bright red as possible.

When forged too cold the hammer will draw the surface away from the center, and a fracture will be the result, especially if forged with a small hammer and the steel is not thoroughly heated. If a large hammer is used on a small forging not properly heated it will break the steel. When a tool is forged, and while still red hot, it can be easily ground on a dry emery wheel to correct shape, and then should be reheated to a red heat and laid down to cool in a dry place to do away with all forging strains.

The tool should then be heated slowly to a good red heat and the point of the tool to a good sweating heat and plunged in oil or hardened in air. One essential is a clean fire, and a blast should not touch steel while heating to harden.

Heating and Hardening Carbon Tool Steel

All tools should be hardened at as uniform and low a heat as possible. As there is a great deal of difference in the shape of the tool and different uses for which they are made a great deal must depend on the good judgment of the man doing the work, but low and uniform heat and a clean surface on the piece to be hardened are absolutely necessary. It is better for a tool to have been hardened at too low a heat and not necessitate the drawing of the temper than for a tool to be so brittle and hard that it has to be softened by tempering. The tool will have a poor cutting edge in this case, caused by high heat in hardening, which no amount of tempering will refine. Do not heat to a strict line for hardening; also avoid dipping to a strict line on tools not hardened all over, such as reamers, drills, taps, etc.

All tools whether made on the anvil or by machine should be free of scratch marks or marked by lathe, chisel or tool, as the mark will be a starting point for a crack or break when hardening.

Milling cutters and large reamers can be successfully hardened by dipping into water slowly until teeth or surface is hardened, and before body is cold take from water bath



and plunge quickly in oil and leave there until thoroughly cold. Plenty of clean water is the best hardening bath; while oil is satisfactory where no extreme hardness is required. While hardening large tools be sure and keep all other work away from the tool forge, even if you have to use another man for it, so he can devote his whole time and attention to what he is doing, and it will be a saving of labor and material.

Efficiency and Scientific Management in the Smith Shop

THOMAS B. GELLATHY

The smith's shop, even in the present days of system, shop management and efficiency, with most firms gets the least and last consideration.

Any place seems good enough for a blacksmith shop—down the cellar, some place where there is no fresh air and very little light, and a low roof where the smoke and gases hang.

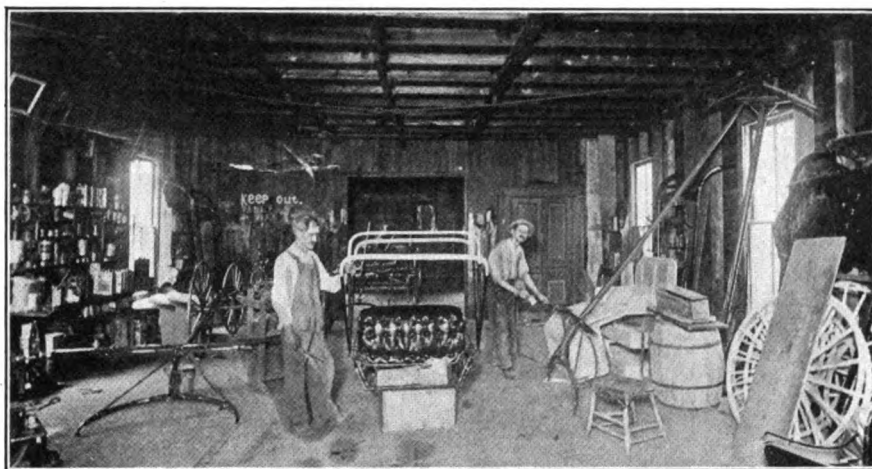
To an employer who has a good smith, and whose work goes on day after day and year after year without serious mistake, the smith seems to fill a small place. But let that smith leave and let some fellow less capable take his place, how they begin to take notice and to realize how valuable the other man was.

The trouble it seems is as much with the men themselves as with the employer. The smith gets careless when cutting off stock. He throws the scrap or cut-offs on the floor and lets them lie. That one thing alone helps to keep the smith and his shop in a poor condition.

The idea of a great many men is to have as much iron and work on hand as possible, so that the foreman or the employer may think that they are very busy. My experience is that a man who has been smart enough to fill the position of a foreman or employer is not so easily fooled.

There is not a foreman but who likes to see his shop nice and clean—everything in order and tools in place, so that the men may at a moment's notice proceed to turn out the work.

My ideal of a smith's shop, although I have not been able to



THE PAINT AND TRIM SHOP OF MR. C. E. PARISH OF WEST VIRGINIA
"THE PAST YEAR WAS AN EXCELLENT BUSINESS YEAR AND 1913 PROMISES TO BREAK RECORDS", SAYS MR. PARISH

reach it yet, but may some day, is the following:

First.—A shop well ventilated and with plenty of light and room. Some manufacturers are advertising improved ventilating systems and are ready to prove that the firms who have had their systems installed have found the men turning out more work.

Second.—The forges laid out on the plan best suited for the work to be done at each forge; near to the steam and trip hammers, as the work demands, and not placed close to the wall as is the usual custom. Put the forge in the center of the shop, if possible, so that the smith may have plenty of room to do his work.

If conditions necessitate that the forges be placed along the wall, have them five or six feet away from the wall. This prevents rub-

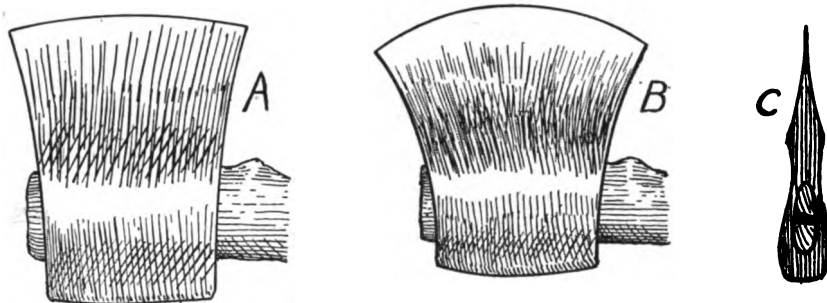
bish and scrap from being thrown behind the forge, and this space can be used for tool racks or perhaps a bench.

Third.—Cranes form another important part of the shop, and placed between the heavy fires and the steam hammer they do away with the lifting and carrying of heavy stock. These, I think, are three of the most important items in the smith's shop.

As the days of apprenticeships are about past, as far as the manufacturers are concerned, the foreman or head of the department ought to specialize his men. Take a man and break him in on a certain class of work, let him have special tools suitable for his work. For instance, if he is accustomed to making hooks let him have punches, gouges, necking tools and swages to fit his anvil and also stamping



THE GENERAL SHOP OF MR. DAVID BROWN, IN MASSACHUSETTS, WHERE BUSINESS APPEARS TO BE GOOD



THE ORIGINAL AXE AND HOW IT WAS RE-DRESSED

tools for steam hammer. And have the tools marked with a number or figure, so the man may know his own and be held responsible for the tools.

If tools are marked in this way it gives the man more interest and pride in keeping his too. properly in order for his work.

In a place without system of some kind a man is inclined to borrow a tool and drop it at his feet, and even to let the next fellow dress it if he choose.

Another time saver is to have the stock cut off at the saw or by some handy helpers at the spare fire and laid down at the forge. Then when a smith is finished with one job he can start right on the next.

Templates made of sheet iron are very helpful time savers. Or, better still, when the work is standard, have a sample forging, as some men can work from samples better than from drawings.

Some men are more skillful than others at handling the stock at the steam hammer and are able to turn out the work quickly. This fact can be profitably worked even in a small shop by having one man rough out the work and let the others, less capable at the hammer, finish the work.

Making blacksmith tools is also important. Have one man who is careful in heating and forging steel tools do this work and you get all the tools uniform in shape, weight and quality. You save time; thereby knowing exactly where the trouble is in breakages and you save yourself endless trouble and expense.

Marking the hammer tools is also a good idea. A pair of $1\frac{3}{8}$ -inch swages will look like $1\frac{1}{2}$ -inch when worn, and you cannot very well rely on measurement with the rule

on the outside. As a result, a man depending on the swage instead of his calipers gets the job below size.



Re-Dressing Axes and a Planer Knife Problem

DAYTON O. SHAW

It has been said that no man can re-dress an axe so it will be good for anything. Why not? In my time I have re-dressed a large number of axes, both new and old, with good success. Of course, once in a while one would break, but they would compare favorably with the axes you buy at the store. Years ago when I was learning the trade there was an old smith who made quite a business of upsetting axes. I asked a woodsman how he liked this smith's work. "I will tell you," said he. "I carry six axes to him and if I can get one out of the six that will not break I feel well paid, because I can chop so much more with his axes than those I buy at the store." After examining them I found that they were drawn out thin, and the bit shaped something like B in the engraving. At A is shown the shape of the bit as we buy it at the store.

Now the secret is this: The axes you buy are so square across the bit

that they strike the wood dead, which gives the chopper something of a jar. Again, they are so thick near the edge that the woodsman has to spend half a day grinding them or have them drawn out by the smith. A short time ago a man brought a new four-pound axe into the shop. "I can't chop with this thing," said he. After I had dressed it over he came back and said, "I don't think I paid you enough for that axe; it just draws right into the wood." I am not writing this to boast, but to show the difference between the right and the wrong shape of an axe.

In the first place I never upset an axe. Why? Because the edges are thin and, as you cannot change the grain of the steel clear through the work, when you begin to draw or flatten it there is a fracture in the steel where the grain changes the other way. We cannot see it with the eye, but it is quickly found when put to work. One should never touch an axe unless it contains steel enough to draw and flatten and trim into shape. Then, after forging, the work should be heated up red and put into the ashes until cold and then tempered. You cannot judge by the color altogether, because there are so many different kinds of steel. Some are drawn to a light blue while others are left at a light brown. It is better to try them with a file to make sure.

I remember two wood choppers who worked one half day grinding. They were at the stone so long that I took notice and found that they were concaving an axe. "It chops so much easier," said one. I have since that time concaved axes when the customer wanted it done that way. However, I would not recommend this style for splitting wood, but for chopping it has no equal.

The reader will see I have taken my ideas from men who have had experience in using the axe for their support. In conclusion I would say

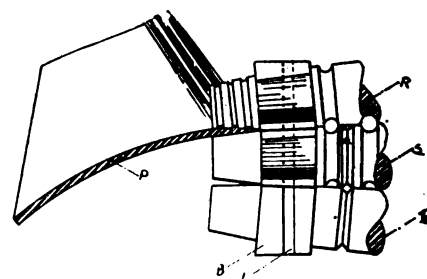


FIG. 1—SHOWING THE ROLLS OF THE DISC SHARPENER



that the model axe has a wide, round bit, is hammered thin and is concaved. The engraving at C shows an edge view of a concaved axe.

Now, brother smiths, let us get together often and talk things over in a confidential way. The best men sometimes get "stumped." Let us know how you have overcome some of your difficulties, so that we may profit by your experiences. It is the difficult things that keep us learning.

Here is a little experience I once had: A customer brought in some planer cutters to be tempered. I think they were 14 inches long by 6 inches wide. All cutters of this size that I have handled were steel plated (i. e., tool steel welded to soft steel). There were six in this lot to work with. I had a large power forge. I heated the pieces as evenly as possible in a charcoal fire and annealed them in ashes. When cold I heated them again and hardened. The first one I took from the bath had a most beautiful curve. I brightened the surface with emery cloth and put the piece between two plates of red hot iron about two inches from the cutting edges. When the color began to show I placed the cutter on a level platen and before the color had reached the edge I had pened the work out straight and level. Now, the pieces were treated as near alike as possible, yet four out of the six had to be pened into shape, while two were perfect. Who will explain why they were not all perfect?

A Plow and Disc Sharpener

A. C. GOUGH, M. E.

When the writer was a boy too small to handle a plow point larger than the "one mule plow" used in the south twenty years ago the pleasure of doing the work was so great that any improved equipment beyond the hammer and anvil would not have been appreciated. However, one does not have to wait until he has assumed the responsibilities of a man and acquired ideals regarding methods and equipments, but just about as soon as the workman can handle the lays of the large plows and road machines he would usually be willing to introduce a labor and time-saving device to assist in this work.

While the ordinary work produced in the shop may lack rhythm and

harmony in color, and the details and proportion may not be according to artistic judgment, yet the honest, well directed effort is not without appreciation by every man who is a true mechanic and who possesses that part of the artistic sense. It is quite possible that, in some cases, the great pleasure which the good mechanic finds in performing every detail in a way that he knows is right and will produce the desired result in the whole is somewhat responsible for the occasional indifference to improved labor and time-saving methods. However, this love for honest effort which is characteristic of good hand-wrought products has not prevented the great host of repair men—

all the principles included in this machine have practical demonstration in the shops or engineering work.

The design produced here is along lines which may render it possible to construct the machine in the repair shop.

As all know who are familiar with this class of work it is rather difficult to hold a plow lay or scraper under the hammer in just the right way so that the work will not somewhat lose the proper form. Sometimes, when not properly welded or the lay is thin, the lay and bar may be separated by the force of the blows while sharpening. It would be possible, by using a rolling or squeezing process for drawing out the lays, to avoid

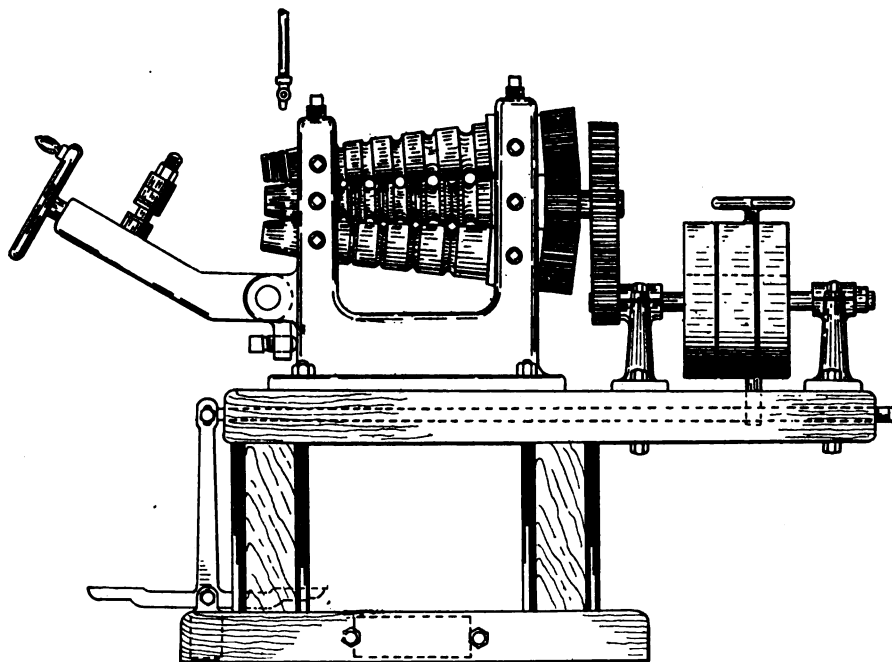


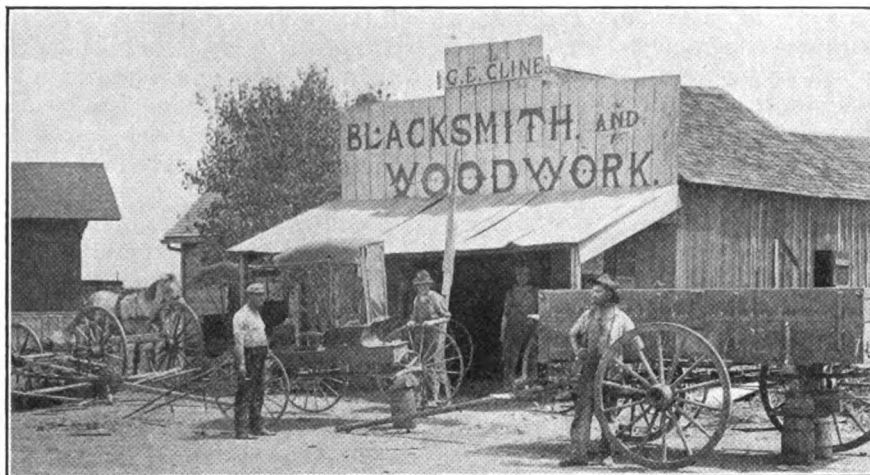
FIG. 2—THE PLOW AND DISC SHARPENER VIEWED FROM THE SIDE

important factors in the industrial world—from keeping up with the development of the times in their respective lines (sometimes a little in advance); but rather many have been quick to use their own and the ideas of others to assist them in the development of the modern shop.

It was several years ago, while handling a county contract for repairing road-making machines, that the writer conceived the idea here illustrated. That he has for several years been devoting his time to engineering subjects and to other shops may account for the fact that there has not already been constructed a plow and disc sharpener along these lines. The assurance goes with this article, however, that

the strain caused by the hammer blows. A method similar to that of the roller disc sharpener might be employed. The advantage of the roller disc sharpener, however, is largely due to the fact that no material is wasted, as in grinding, and the metal being compressed may have a greater density and hardness; not that the grinding process causes any undue warping or strain.

It requires considerable pressure to hold the work between the rolls arranged as in the disc sharpener. This would probably defeat the purpose of such an arrangement for sharpening plow lays; but by using two sets of rolls, the first being corrugated somewhat, it is believed that this defect could be avoided entirely.



MR. GEO. E. CLINE'S OKLAHOMA SHOP IS EQUIPPED WITH POWER MACHINES

The corrugations should not be too many nor too deep; and the corners well rounded, in order to avoid a "cold shut" being made when next passing the lay between the smooth rolls. The corrugations are, perhaps, somewhat exaggerated in Fig. 1—where R represents the corrugated roll; S, the middle roll; T, the bottom roll; P, a section of the plow lay; B, a form of bearing for the rolls; L being a slot into which the end of a screw projects which retains the bearing.

Combination tools and machines, as a rule, are not desirable in the well equipped shop; but where it is not necessary to change parts or to set up the machine for each job they may be economical and even convenient. It is considered desirable in this connection to include a plow

sharpener, disc sharpener and stock rolls in one design. The machine shown, Fig. 2, is designed to run in either direction, or to be reversed instantly; as would be necessary when used for sharpening plows. This is accomplished by having an open and a crossed belt which are shifted by the foot as indicated—the pulleys and belts being arranged after the method used upon a planer or gear shaper. It is also necessary to have the rolls reversible, in order to use the middle portion for stock rolls. Unfortunately, the taper of the rolls renders them unsuitable for flat or rectangular stock.

As mentioned before, this machine as a disc sharpener employs practically the same principle as the standard roller disc sharpener; the disc being secured upon a rotating member

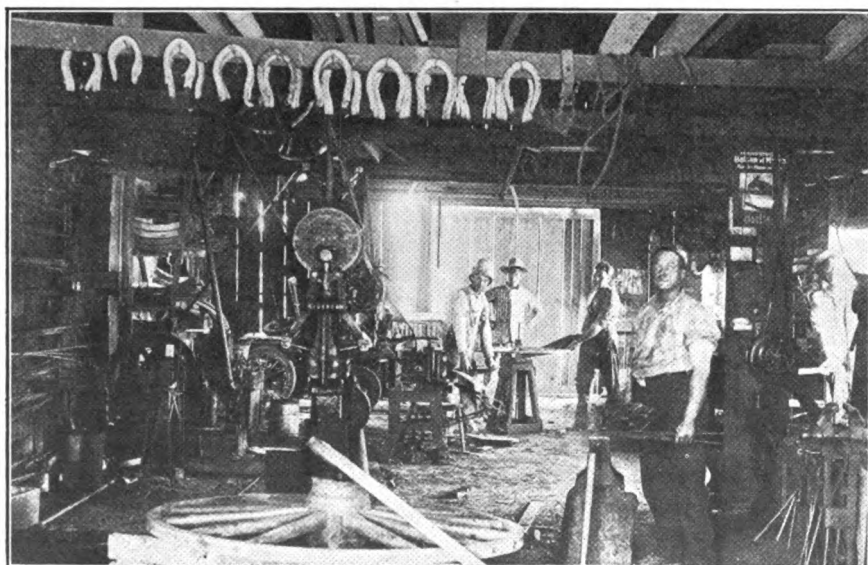
in the proper relative position to the two lower rolls. When sharpening plow lays, the edge of the lay is heated over four or five inches, *better along the entire length of the lay*, and passed between the corrugated and middle roll as far as the heat extends; the foot is then placed upon the other end of the foot attachment to the belt shifter which reverses the machine; the lay is next passed between the lower rolls where the process is completed. The rolls are necessarily not large; on this account they had better be made of steel and hardened. This renders it necessary to cool the rolls when passing a very long heated lay between them, which may be done by having a very small nozzle placed above the rolls and directed downward, as indicated. Ordinarily, a few drops of water would be sufficient, but conditions might be such that each roll would need to be sprinkled with water, in order to keep the temperature of the rolls within the desired limits.

To Drill Spring Steel

C. W. M. BURROUGHS

I have just learned another thing that perhaps may be new to some of the craftsmen. I have always said that alcohol in any form had no place in a shop (for it sometimes gets in the smith, then there is trouble).

The other day I was trying to drill holes in a spring, but it was no use, they were harder than the drills and I gave it up, and turning to a customer (an old machinist, waiting to have his horse shod) said "If you know any way that I can drill holes in that spring, let's hear from you." He replied "If you had some wood alcohol, perhaps you could drill it." I doubted it, but thought I would try it. I went out and got some wood alcohol and presently the drill did the work. Again, today, when trying to tap a thread in cast iron, the hole was a little too small for the plug tap, so that it stuck and would not go. I tried the alcohol on the tap and experienced one of my happy surprises in finding it take hold so easily. I am sending this as a New Year's gift to all brother smiths who may not know of it.



POWER SAVES THE BACK AND INCREASES THE PROFITS OF THE SHOP—INTERIOR OF MR. CLINE'S SHOP



A Big Job and How It Was Done

J. A. GRAHAM

I was impressed some years ago by an article from a brother mechanic who never "turned down" a job of any kind, no matter how difficult. I was working at that time at a large saw mill which had just been erected in one of the towns on the Pacific coast. An expert was sent out to start the machinery and all went well while he was there; but in a few days everything did not work so smoothly. The sawyer had never handled a steam-feed log carrier before, and one day he became confused with his saw levers and he pushed the log carrier through the end of the building, bursting out the steam head in the cylinder and bending the piston about two feet from the end at an angle of about 30 degrees. The packing gland just at the bend was stuck on the piston. The company was in a serious predicament, as a large force of men had just been put to work—perhaps some three hundred. Everything pointed to an inevitable shut-down until a new piston could be made at the factories in Pennsylvania; there being no lathe in any of the western cities capable of handling this piston, which was 5 inches in diameter and 52 feet in length; this mill being equipped to saw 50-foot lumber. (Now, to the easterner this may seem large, but to those who have been in the lumber districts along the Pacific coast it is no unusual sight to see a 50-foot stick of timber.) But coming back to the piston; several experts were sent for, but all claimed nothing could be done in the line of repair, except to get a new piston. In the meantime I had thought a whole lot about what this brother had said. Well, the general manager of the company being there I went to him and told him I believed I could fix the piston, and a new steam-head could be cast at 'most any foundry, using the broken old one as a pattern. I explained matters to him the best I could, and he studied a little bit and finally said: "Well, young man, if you can repair it, it will be a feather in your cap." I told him I would need plenty of help. He told me to command the "whole force" if I needed them. There being several millwrights and carpenters there I put them to work building a scaffold

to swing the piston. We built a forge outside at one end of the scaffolding and I moved my blower out. We swung our piston, placed it in the fire and I built a coke fire over it, heating it carefully so as not to overheat the packing gland (which, as I have stated before, was stuck at the bend), swung it out over the anvil and with a helper and myself with a 12- and a 16-pound sledge straightened it sufficiently to remove the packing gland with one heat. Our main obstruction now being out of the way we proceeded to reheat and hammer until we got it straight. The heating had scaled the steel until it was considerably too small at that point. I had a large leveling block which was 3 feet square and 3 inches thick. We stood this up on end and against large posts in the ground and braced

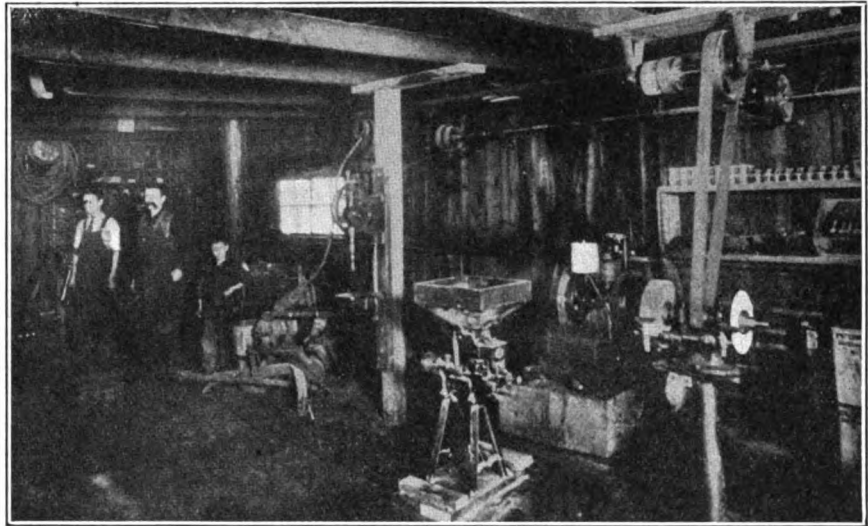
work. As a reward for my work, nothing was said by any of the company, but at the end of the month when I received my pay envelope two twenty-dollar bills were pinned to my check and a note of congratulation signed by the head men of the company.

Fixing Prices to Get a Profit

A. M. BURROUGHS

A blacksmith shop in a Wisconsin town had been dragging along for several years, supposedly making a profit.

Three different men had gone into partnership with the original owner, and after a year or so had withdrawn, leaving a part of their capital behind



A CORNER OF THE WASHINGTON STATE SHOP RUN BY MR. F. J. WILLETT WHO DOES ALL KINDS OF AUTOMOBILE AND BLACKSMITH WORK

them well from behind. We heated the piston again and swung it against this block of iron, the piston acting as a battering ram. We upset it to a sufficient size to allow it to be dressed down, and while it was shortened about an inch in length this made no difference, as the travel of the piston is governed by the sawyer and by a manipulation of levers.

We let it cool off and proceeded with rasps and files and a pair of calipers to dress down, which was a slow, tedious job, but we worked with a will, knowing we were sure of success at any rate. In a little less than 36 hours we had it absolutely true in every respect. In another 24 hours we had received the steam-head from the foundry and all hands were at

them as "pay" for the "experience."

The fourth partner was a young fellow who had spent several years knocking about in the cities and towns. He had a little business experience and a lot of shop knowledge. When he formed the partnership he determined to find out just how things stood—though he didn't know the shop had already frozen out three partners.

He soon learned that most of the man's profits were imaginary. While the trade ran to a nice figure, the profits were mostly on paper.

His trouble was that while estimating his cost of doing business as a certain percentage of the gross business, which is the *selling* price, he added this same percentage to the



cost price when figuring the selling prices of individual items.

He knew that the percentage of his expenses was figured on the gross business, but he didn't realize that a percentage of the gross business is more than the same percentage of the invoice cost.

If you figure your cost of doing business as a percentage of your gross business, you must, of course, allow that much of your selling price for cost of doing business.

When you do \$1 worth of work, you say that a certain per cent of that is profit, a certain per cent goes for cost of doing business, and the balance is for the cost of the stock.

Take any item in your business and deduct the two percentages from the selling price you have established, and see if you still have the cost price left.

Your profits and cost of doing business come out of the dollar you take in—not out of the 60 or 70 or 80 cents you pay out for the material used.

If you buy a pair of shoes for \$2 and sell them for \$3, your profit comes out of the \$3—not the \$2. The profit can only come out of the selling price.

Get that straight—when the \$2 is invested in the pair of shoes, it is gone. There is no \$2 any more. There is no money at all—nothing but a pair of shoes.

If you don't sell the shoes, there will never be any profit. But if you do sell the shoes, you have \$3 or whatever you sell them for—you never see the \$2.

Since you have nothing left but the \$3, your profit can only come out of that. Everything comes out of the \$3. Nothing can come out of the \$2. That goes to pay for the goods. The \$1 left after the goods are paid for is a part of the \$3.



TAKE OUT THE COST AND THERE'S NOT MUCH LEFT

In the shop referred to, work was priced by adding what was really a percentage of the selling price to the cost price.

This mixing of methods resulted in a loss, except on a few items which

permitted a very high percentage of profit.

Where there was competition on any job, 18% of the cost price was added for cost of doing business, and 10% of the cost price was added for profit.

This net profit of 10% looked good "on paper," but that was the only



TAKING A PART OF EACH DOLLAR

place it could be found. It wasn't in the cash drawer. It never got into the bank. The proprietors never saw it in money.

The real cost of doing business was 22% instead of 18%. Part of the expenses had been figured as investment. Other items had not been included at all.

If you think he could make a profit on that basis, try to figure it out.

Add 28% to \$1; then subtract 22% from the selling price it gives you. Adding 28% to \$1 gives you \$1.28. 22% of \$1.28 is 28.2 cents. His real cost of doing business, 22%, taken from the selling price, amounted to more than his 28% added to the cost price.

A Michigan man did a gross business of \$20,000. His cost of doing business was \$4,600, or 23%, and he figured for 10% net profit.

His purchases during the year aggregated \$15,000. To this he added, in the process of marking each item during the year, the gross profit he wanted to make, 33%, making the goods sell at \$20,000.

His banker asked him recently how much profit he made last year. He said \$2,000—10% on his \$20,000 gross business.

He made the mistake of assuming that 33% added to his cost was the same as 33% of his selling price.

Let's see how far he was wrong; 33% added to \$15,000 makes \$19,950. (He evidently added a little more than 33% to some items.) 33% taken from \$20,000 leaves \$13,400.

If he paid \$15,000 for the goods he sold for \$20,000, and his cost of doing business was \$4,600, his net profit was only \$400. \$400 is only 2% on \$20,000.

In the shop referred to they handled as a side-line a certain kind of stove which was also handled by a competitor. The wholesale price was \$9.25,

and the freight and cartage were 75 cents; making the stove cost \$10, set down in the store.

Competition was very keen on this stove, and it was decided to cut the profit to 10% net. So 18% of the cost was added for cost of doing business and 10% for profit; making the stove sell at \$12.80.

The hardware man thought he was making a profit of \$1. Let us see what the new partner showed him:

The real cost of doing business, as already explained, was 22% instead of 18%, but the new partner figured it first on the 18%, to illustrate the principle.

If the article cost \$10 and it was desired to make 28% gross profit, we must consider the selling price as 100%, and the cost price as 72%, or all of that 100%, except the gross profit of 28%.

Now if \$10 is 72% of the selling price, the selling price must be \$13.89.

Here is the way to work it out:

Selling price 100%
Cost to do business 18%
Profit desired 10% .. 28%

Wholesale cost 72%
Cost price, in percentage, .72—
\$10.00 cost in money.

\$13.888. Answer.

Selling price, \$13.89.

Reducing the problem back, to prove it, we have:

\$13.89 Selling price
.28 Percentage

11112
2778

\$3.8892 Gross profit
\$13.89 Selling price
3.89 Gross profit

\$10.00 Cost price.

From this it seems clear that the selling price should have been \$1.09 higher than it was, to allow 10% net profit, after allowing 18% for cost of doing business.

In reality it took \$2.30 of the \$2.80 gross profits to cover the 18% cost of doing business.

But his real cost of doing business was 22%, instead of 18%. So the cost price should have been but 68% of the correct selling price. (22% and 10% subtracted from 100% leaves 68%.)

Figuring the same as before, \$10 is 68% of \$14.70, which is \$1.30



ASTONISHED AT THE FACTS



above the price at which the stoves were actually sold.

Taking 22% out of \$14.70 for cost of doing business and 10% for profit leaves almost exactly \$10.

Practically all merchants figure their cost of doing business as a percentage of the gross sales, the *selling* price. Yet a large percentage of them figure as if this were a percentage of the *cost* price.

Changing the base of figuring is dangerous. It fools retailers into thinking they are getting more profit than they really are. Here is a case which illustrates that point.

A certain clothier, who was figuring for 30% net profit, planned a special "25% off" sale. He thought he would still make 5% net, and could afford to sacrifice part of his profit for advertising purposes.

Suits marked to sell at \$20 were reduced 25%, or chopped down to \$15.

These suits cost \$13.50. Twenty per cent was added for cost of doing business and 30% for profit; making the selling price a fraction over the \$20.

Twenty per cent cost of doing business on the original marked price (\$20) is \$4. Adding \$4 to \$13.50 (cost price) gives us \$17.50. So when he sold that suit at \$15 he actually lost \$2.50.

During the sale he disposed of \$3,000 worth of clothing—at a loss of \$500 in cash. Yet he thought he was making 5%, or \$150.

He was all right as long as he added 50% to his cost price, though it allowed him less profit above his cost of doing business than he thought, but when he began cutting prices, he ran into unseen danger.

Add 50% to \$13.50. Then deduct 50% from the new price. You lose \$3.38 in the operation.

Apply this to some of *your* prices.

This method of arriving at selling prices differs slightly from the regular methods of figuring percentages. We have found that while the regular percentage method is correct, many people fail to remember that a percentage added to the cost of goods is less than the same percentage of the price thus marked.

Adding 10% to the invoice cost of an article, allows 10% profit on the 70 or 80 cents you *pay* for the goods and not 10% of the dollar in the cash drawer.

If it were convenient to arrive at percentages on a basis of the cost price, and to always remember that the per cent of profit *added to the cost* price is always a profit *on the cost* price and *not* a percentage of the money *taken in*, then the old percentage method would be fine.

If your profit is to *come out of the selling* price, and *not out of the cost* price, it is plain that the *percentages* should be *figured on the selling* price. (Copyright, Burroughs Adding Machine Co.)

When Interest Can Be Collected on Money Overdue

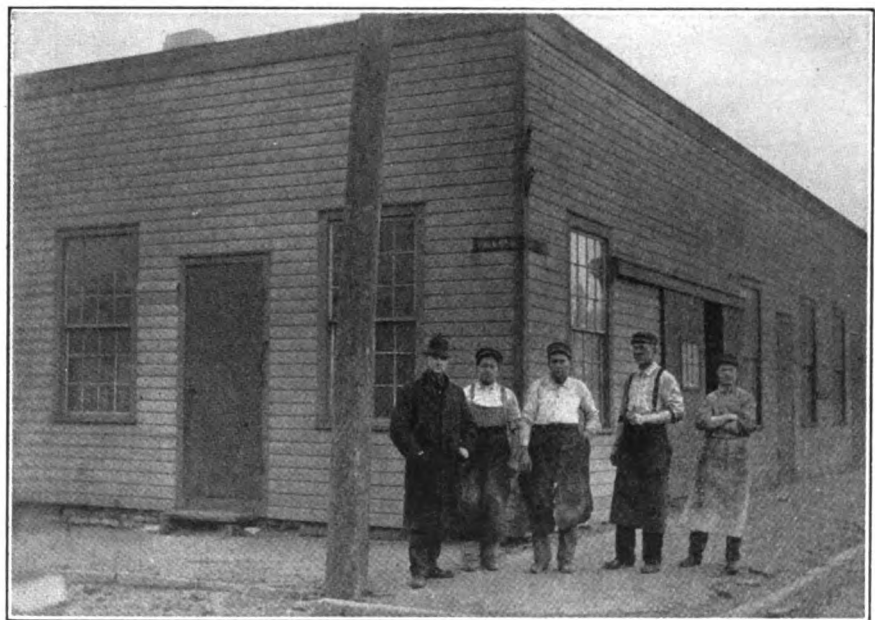
I am told that the wholesale trade in various lines are discussing the expediency of charging their customers interest on overdue accounts. When interest can be collected, in cases where there has been no express contract to pay it, is therefore a timely subject, and I shall say something about it in this article.

There is no trouble collecting interest in cases where the parties have made an express contract to pay it, but like many other kind of business

Let me say parenthetically that the average business man has an abiding dread of litigation, courts and lawyers, but in the majority of cases he is brought into contact with these things because of his own negligence in leaving loopholes in business matters that should be water tight. This question of whether interest is to be paid on money overdue is but one case of many.

In the average case, a creditor to whom money is owed, where it is due at a certain time, can collect interest on it from the day it is due—and unpaid—under either of two theories. First, where it is the custom or usage of the particular business to collect it in transactions of the same kind; second, as a sort of damages for breach of contract to pay the principal at a certain time.

This includes ordinary book accounts. Let me assume that it is the custom of the jobbing trade to grant thirty days' credit, and to charge interest on all accounts more than thirty days old. A is a blacksmith and buys a bill of goods from B, a jobber. A does not pay in thirty days, but takes sixty. B can collect interest for the extra thirty



THE SHOP OF MR. JOSEPH E. MARRETT AND THE WORKING FORCE—
A GENERAL SMITHY OF ILLINOIS

contract, contracts involving the payment of money are often carelessly silent about the payment of interest. Therefore the courts are often called upon to decide from the circumstances of the case whether interest ought reasonably to be paid.

days, if he wishes to, on the ground that it was the custom of the trade, of which A, being of the trade, must have known. This is so, even if A and B have made no agreement to pay interest, and where B has given A no notice that interest would be demanded.



In cases where there is no established custom of the trade to charge interest, a jobber, for instance, can make his own custom. For example, A opens an account with B, a jobber. B, in discussing terms, tells him that his terms are sixty days net, 2 per cent in ten, interest charged after sixty days. A buys several bills and pays all within sixty days except the last, on which he takes ninety. B charges thirty days' interest, and he can collect it, because it was his custom or practice to do so, and A had notice of it.

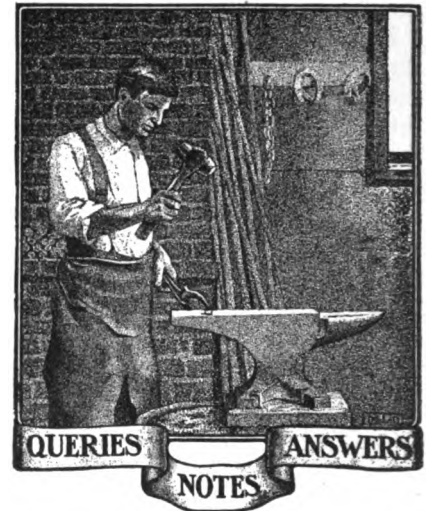
But in the absence of general custom of the trade, B would have to give A notice before he collected interest on his overdue account, particularly if B had accepted payment of overdue accounts from A, before, without asking interest. For while B could establish a custom of his own to collect interest on overdue accounts, so by not charging interest in past dealings he can establish a custom *not* to collect it, and if A is to be bound by the first custom B must be bound by the second.

In a great many cases interest can be collected from the very minute

promissory note, or on a loan that goes past the time. This is quite irrespective of whether there was any contract to pay interest; interest is payable even without any contract to pay it, always provided the creditor has not lost his right to collect it by some previous course of dealings, as explained above.

There are a few qualifications. Often two men will have mutual dealings. Two merchants in a country town, for example, will buy of each other, or their families will, and once in a while will strike a balance. Of course in every such case but one man will owe money. He cannot be compelled to pay interest until a balance is struck and demand is made upon him for its payment. In fact, the right to collect interest is often dependent on a demand being made for the payment of the principal. There are some debts that are not due except on demand. For instance, sometimes goods are sold without any time being specified for payment. Where the regular credit terms do not govern, such debts are due on demand, and interest is

sisting of six bricklayers; six carpenters; five machinists and six patternmakers.



Drilling Cast Iron.—Can you give me a recipe to soften the burrs in a sweep grinder so that I can drill holes in them? This is the only casting that I have failed to work with common sulphur.

T. MANDERSCHIED, Oklahoma.

Dressing Corn Buhrs.—Can some reader give me some information on dressing corn buhrs? This information would also interest other smiths, as there are quite a few putting in buhrs to run with their engines.

HUGH A. LYNN, Kentucky.

Punch and Shear Machines.—We are considering the purchase and installation of a punching and shearing machine. Can any readers give us any information about this machine? We shall be thankful for any advice.

COOPER & CURD, New Zealand.

Concrete Smith Shop.—I would like to get in touch with blacksmiths who have solid concrete shops. I am thinking about building one and would like to correspond with someone who has had experience with that kind of a building.

J. E. MAYS, Wisconsin.

How to Weld Cast Iron.—First of all take a piece of wrought iron and get it to a white heat; next, get your cast to a cherry red and put it in a sledge to keep it from slipping. Now lay your wrought iron on top and with your hand-hammer press gently but firmly, but under no circumstances hit it, or you will have poor results. If directions are followed you can hit it when cold, and if it breaks it will not break in the weld. In welding cast iron, use no flux nor borax.

CLARENCE KEMMERER, Pennsylvania.

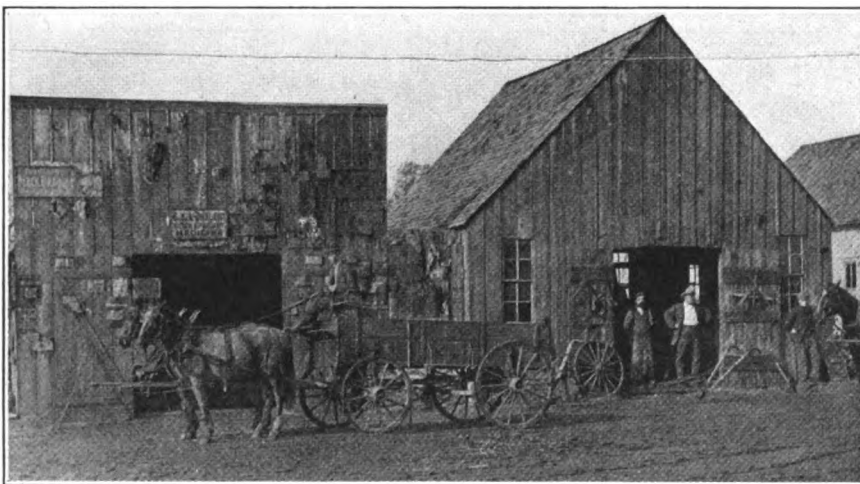
Tempering the Anvil.—In a recent issue a brother wanted to know how to temper an anvil. This is one way that has proved successful with me:

After you have faced your anvil to suit you, heat the face to a cherry heat, place in a tub in the same position as when in use on block; the water in tub coming up half way on anvil. Take two ounces of cyanide of potassium, powdered, place on the face of the anvil. When melted add water to cover anvil and cool as quickly as possible.

You will have an anvil as hard as you want it. Try this.

N. H. BROWNING, Montana.

Soldering Aluminum.—I would like to know through your valuable paper some



IN THE BIG STATE OF TEXAS—MR. W. H. LIGHTFOOT'S GENERAL SHOP

money is due and unpaid, whether on a book account, promissory note, an ordinary loan, or what not. This is on the theory that there was a contract to pay the money at a certain time. If it is not paid by then, the contract is broken, and the creditor is entitled to damages. What is so convenient a measure of damages as legal interest?

So on this theory a seller can demand interest on any book account that is past due, or on any overdue

chargeable only from the date of the demand.

(Copyright by Elton J. Buckley)

Thaddeus Stevens Industrial School

The first Commencement Exercises of the Thaddeus Stevens Industrial School, of Pennsylvania, located in the City of Lancaster, will be held March 28, 1913. A class of twenty-three students will be graduated, con-



method of soldering aluminum. What kind of flux and solder to use and how to proceed with the work. Any information on this subject will be greatly appreciated.

QUERIST.

In Reply.—Take 32 ounces of tin; 15 ounces of zinc; one ounce of lead and a small piece of rosin. Melt all together, mixing the ingredients thoroughly when liquid. When thoroughly mixed allow to cool in forms or molds. This solder is used without a flux, and there is no preparation for the surfaces to be joined except to get them perfectly clean and to heat

Eliminating the Gas and Smoke.—Mr. Wallace of New York would like to know how to create a draft in his chimney with his twenty-inch blower.

I am enclosing a little sketch which gives an idea of the plan we have here in our shop and running all our fires. It does not draw as well as it would were I to take more time with it. It is important when putting up a blower and directing the wind in any particular direction to have the curves nice and round, so as not to check the wind. I would advise Mr. Wallace to run his blower about 1500 R. P. M.; however, he can

should be shod with frog pressure—a bar shoe nailed around the toe, leaving the heels free, will best suit the case. Cold water baths and cold water bandages and frequent foot soakings will tend toward relieving the inflammation and fever, though these will return when the treatment is discontinued. J. C. WEAVER, New York.

A Letter to the Craft.—As a reader of "Our Journal" I am glad to note in it many signs of improvement and progress.

It seems to me that it is in order for us to review the past year, acknowledge our mistakes and try to avoid making them over again.

Let us see what we have done in keeping abreast of the age. Have we thought out a plan to handle the forces of electricity and the necessary machinery for the uplift of the business, and to save our bodies from the daily grind of physical hardships?

The craft should be congratulated upon the opportunity which "Our Journal" offers as a medium of exchanging ideas of varied experience in the trades. Men think differently and have different ways of doing things, but it is not wise in us to think "we know it all" or that our way is perfect. We never get too wise nor too old to learn. We can be taught by babes. By reading of different methods we can be benefited as a body of mechanics.

Is the shop clean and well lighted? Are the tools in good order and kept in their proper places? Have you made more friends than enemies this year? Is the ledger balance all right?

W. H. GUNN, Virginia.

The New Western Blacksmith Price List

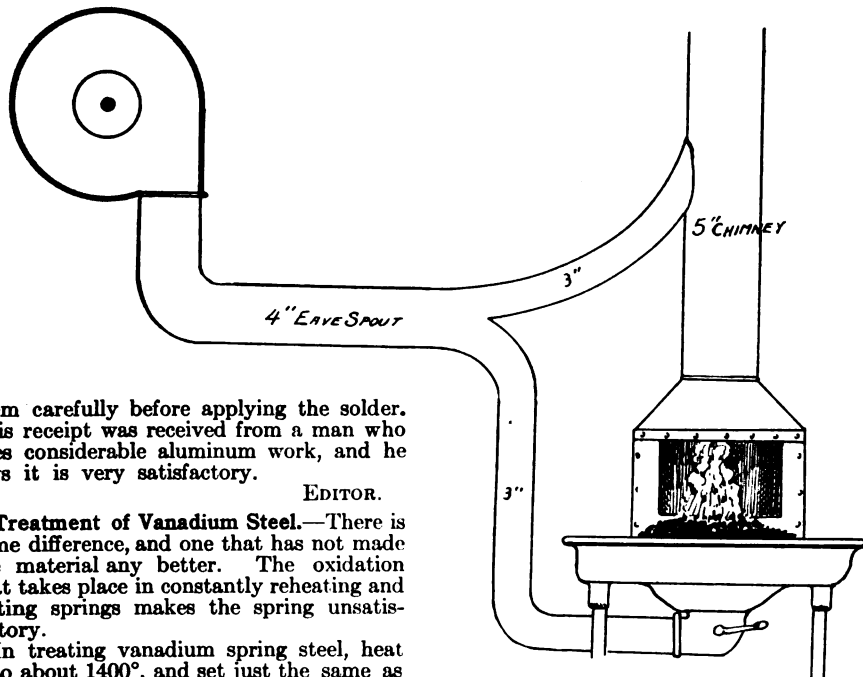
Suggested by the Heavy Hardware Association and Distributed to the Western Trade

Horseshoeing

New Shoes, each	\$.50
Re-setting, each	.25
Stallion Shoes, each	1.00
Stallion Shoes, Re-set, each	1.00
Bar Shoes, Common, each	1.00
Bar Shoes, Hand-made, each	1.25
Neverslip Shoes, New, each	.75
Neverslip Shoes, Re-set, each	.25
Neverslip Calks, each	.06
Trotting Horse Hand-turned, each	1.00
Side and Toe Weight, each	.75
Leather Pads with Packing, ex. each	.25
Air Cushion Pads, extra each	1.25
Paring Horses' Feet, each horse	.25
Shoeing Bronchos and Fractious Horses, extra	1.00

Wagon Ironwork

Irons on Front Bolster	\$ 1.00
Irons on Hind Bolster	1.00
New Bolster End Irons, each bolster	.30
New Bolster Stake Irons, each stake	.60
1 Pair Bolster Plates	1.50
1 New Sand Board Plate Put On	1.25
4 Wagon Tire Cut and Set	2.50
4 Tire Re-set	2.00
4 Tire Re-set and Bolted	3.00
4 Tire Pinned	2.50
4 Tire 3-inch Re-set	3.50
1 Rake Tire Re-set	.50
4 Log Wagon Tires Set	3.00
1 Set New Tire 3-inch	15.00
1 Set New Tire 1 3/4-inch	9.00
1 New Rub Iron Put On	.50
Old Tongue Iron Replaced	.50
Old Tongue Hound Irons Replaced, per pair	.75
1 New Hind Hound Plate	1.00



USING THE BLOWER FOR BLAST AND DRAFT

determine the speed required by testing it. If it doesn't draw enough from the chimney, give the blower more speed, as a twenty-inch blower ought to blow three or four fires for an ordinary blacksmith shop.

It is not necessary for the chimney to be more than four or five inches, as when working right it will take all the smoke easily.

I think Mr. Wallace will have no trouble, providing he follows this plan. We are running our fires exactly the same way and they work satisfactorily. Would like to hear from Mr. Wallace as to his success with this plan in his shop.

R. C. HOLDRIDGE, Wisconsin.

Shoeing for Side Bones.—I am a reader of THE AMERICAN BLACKSMITH and enjoy reading the paper very much. I am running a horseshoeing and general repair shop and am doing a fine business.

I am shoeing a horse that has side bones on his front feet and I am having trouble with same. Could some brother smith give me some information in regard to shoeing for side bones, and also if there is anything else that can be done beside shoeing to relieve him. He is a fine young horse and is used on the road a great deal. In the first place he was chill foundered, which left him a trifle sore, and then side bones developed. Any information on this subject will be appreciated.

HARRY A. DIETTERICK, Pennsylvania.

In Reply.—There is little to be done by the shoer in the treatment of side bones. High heels on the shoes placed on the diseased feet will relieve the animal. The feet

them carefully before applying the solder. This receipt was received from a man who does considerable aluminum work, and he says it is very satisfactory.

EDITOR.

Treatment of Vanadium Steel.—There is some difference, and one that has not made the material any better. The oxidation that takes place in constantly reheating and setting springs makes the spring unsatisfactory.

In treating vanadium spring steel, heat it to about 1400°, and set just the same as any other steel; then dip in oil, let it stay in oil until cold, then draw back until the scales shed freely—I might say a little more freely than it does on the ordinary carbon steel. We have but very little trouble with our vanadium springs, on account of just receiving new engines that have the vanadium steel under them. I have not gone into the vanadium steel question as extensively as I expect to in the next year, as I intend to put in a heat-treating plant in which I intend to take the vanadium forgings and other steels as well.

H. D. WRIGHT, Indiana.

The Advertisements—Tire Setting.—You want to know who reads the advertisements. Well, I read some of them. I have had dealings with The Electric Wheel Company, Quincy, Ill., and I am writing the May Bending Works. We have an emery stand, iron and wood lathe, a Famous woodworker from Sidney Tool Company, a Fairbanks-Morse engine and many small tools from the different advertisers. I have been very much amused at the ideas some have of hot and cold tire-setting. I have never seen one used, but believe they are all right for the purpose. Some say you cannot make a tire tight, as the tire will "give back" after setting up, which of course it will, but any man who has worked wood knows that the wood will "give back" more than the cold iron. I think that it would be impossible to put one tire outside of another tire and shut it up and make it tight. But a little good common sense and some mother wit mixed in would tell anybody that the wood rim will come back as much as the metal tire, and a little more if it has the chance.

A. S. TUCKER, Delaware.



New Hound Irons Braces, each.....	\$.75
New Hammer Strap.....	.50
New Circle Post, each.....	.25
New Tongue Cap.....	.75
New Tongue Rod.....	.50
New Tongue Plate.....	.25
1 New Wagon Wrench.....	.50
Hub Bands, Old, each.....	.15
Hub Bands, New, each.....	.25
King-bolt, each.....	.50
New Brake Shoes Put On, each.....	.35
Queen-bolt, each.....	.75
Box Strap Irons Put On, each.....	.25
Seat Springs, each.....	.75
4, 3 1/4 x 10 New Skeins with Boxing Put In.....	8.00
1 New Skein Only Put In.....	2.50
1 New Skein Boxing Only.....	1.00
4, 3 1/4 x 10 Steel Skeins, extra.....	2.00
1 Geisler Brake Ratchet Put On.....	1.25
Top Iron on Box, Button Box.....	.90
Box Rods, each.....	.25
New Center Clips on Single-trees, ea.....	.25
New Ferrule on Single-trees, each.....	.20
New Neckyoke Center, each.....	.50
Neckyoke Ferrules, each.....	.15
Seat Hooks, Set.....	.60
Rub Irons, Not Put On, each.....	.25
Hub Band, Not Put On, each.....	.25

Wagon Woodwork

Bolsters, Front or Hind, each.....	\$ 2.50
Bolster Stakes, Front or Hind, each.....	.50
Set of Rims, 1 1/4-inch Tread.....	8.50
1/2 Rim, 1 1/4-inch Tread.....	1.50
Set of Rims, 2 1/2 x 2.....	10.00
1/2 Rim, 2 1/2 x 2.....	1.50
Set Truck Rims, 3 x 1 1/4.....	10.50
1/2 Rim, 3 x 1 1/4.....	1.75
Set Truck Rims, 4 x 1 1/4.....	13.00
1/2 Rim, 4 x 1 1/4.....	1.75
Truck Felloes, 2 1/2 or 3-inch, each.....	1.25
Truck Felloes, 3 1/2 or 4-inch, each.....	1.50
Wagon Felloes, each.....	.50
Wagon Felloes, set.....	8.00
Spokes Single, each.....	.35
Spokes, Whole Wheel, each.....	.25
Hubs, per set.....	5.00
Hubs, One.....	1.50
Reaches, 8 ft.....	1.25
Reaches, 10 ft.....	1.50
Reaches, 12 ft.....	1.75
New Tongues, Oak or Ash with Old Irons.....	3.75
Plow Tongues, Oak or Ash.....	3.00
Sleigh Tongues, square.....	3.00
Harvester Tongues.....	4.50
Tongue Hounds, New, per pair.....	2.00
Tongue Hounds, New, each.....	1.00
Front Hounds, per pair.....	2.50
Front Hounds, each.....	1.35
Hind Hounds, per pair.....	2.50
Hind Hounds, each.....	1.50
Bent Hounds.....	3.75
Single-trees, each.....	.75
Double-trees, each.....	1.00
Neckyokes, Old Irons.....	.75
Hub, Boxed, each.....	.75
Axles, 3 1/2 x 4 1/2, Maple, \$3.50; Hick., 4.00	4.00
Axles, 4 x 5, Maple, \$4.00; Hick., 4.50	4.50
Sand Boards.....	2.00
Wagon Stakes.....	.35
Box Bottom Labor.....	2.50
Box Bottom, Cross Piece Center.....	.75
Box Bottom, Cross Piece End.....	.50
Box Bottom, per set.....	5.00
Spring Seat, Wood.....	3.00
Seats, Old Iron, each.....	1.50
Seats, New Iron, each.....	5.00
Wagon Shafts, 1 1/2 x 2 1/4, each.....	2.75
Dump End Gate, each.....	1.50
Plain End Gate, each.....	1.25
Wheels Cut Down, per set complete, and Old Tires Set.....	12.00
Setting Boxing, New.....	.75
Setting Boxing, Old.....	.50
Setting Skein, each.....	.50
Eveners, 4 Horse, 6 ft.....	1.75
Eveners, 4 Horse, 7 ft.....	2.00

Eveners, 4 Horse, 8 ft.....	\$ 2.25
Wagon Boxes, 12 inch.....	13.00
Wagon Boxes, 14 inch.....	14.50
Wagon Boxes, 16 inch.....	17.00
Double Box, 12 and 14 inch.....	20.00
Triple Box, 10, 12 and 14 inch.....	25.00

Buggy Ironwork

Buggy Axles Put On, job complete, up to 1 inch.....	\$8.00
Buggy Axles, each, Put On, up to 1 inch.....	2.50
Axles Set, each.....	1.00
Four Buggy Tires, Set Hot.....	3.00
Four Buggy Tires, Set Cold.....	2.50
Re-setting One Old Tire.....	.75
Four Buggy Tires, New.....	7.00
New, One Tire.....	2.25
Buggy Springs Welded, per leaf.....	.75
Iron Replaced on Shafts.....	.50
Shaft Iron Welded.....	.50
Shaft Shackles, each.....	.50
Shaft Eye.....	.75
Pole Irons, Replaced.....	.75
Pole Circle Irons, Replaced.....	.50
Pole Brace, Welded.....	.75
Pole Eye.....	.75
New T-Hammer Strap.....	.75
Axle Clip.....	.25
Saddle Clip.....	.25
Steel Bow Socket.....	.75
One Buggy Single-tree Clevis.....	.25
One Buggy Single-tree Clevis Bolt.....	.10
One Buggy Single-tree Ferrules, each.....	.10
One Buggy Single-tree Cock-eye, each.....	.10
One Buggy Clip King-bolt.....	1.00
One Buggy Reach, Iron Welded on Old Reach.....	.50
One New Whip Socket Put On.....	.50
One New Top Prop Put On.....	.40
One New Top Prop Nut Put On.....	.15
One New Bow Rivet.....	.10
One New Buggy Spring.....	\$2.50 to 3.00
One New Buggy Spring Clip Put On.....	.35
One New Buggy Shackle Clip, Put On.....	.65
Buggy Box in New Wheel, each.....	.50
Buggy Box in Old Wheel, each.....	.25

Buggy Woodwork

Shafts, New, with Old Irons, per pair.....	\$ 3.50
Shafts, Ironed and Painted, Complete.....	5.00
Shafts, Cross Bars, Old Irons.....	1.25
Shafts, New Express, each.....	2.50
Pole Only.....	3.50
Pole, Ironed and Painted, complete, no Neckyoke.....	7.50
Pole Circles, each.....	1.50
Buggy Single-trees.....	.75
Buggy Double-trees.....	1.00
Buggy, Neckyokes.....	1.50
Patent Spokes, Single, each.....	.35
Patent Spokes, Four or More, each.....	.20
Rims, Set 1/2 and 1 inch.....	5.50
Rims, Set over 1 inch.....	6.50
1/2 Rim.....	1.00
One Rim only.....	1.75
Axle Bed.....	1.25
Reach, Single.....	1.00
Reach, pair.....	2.00
Head Block.....	1.50
Spring Bar, Scrolled.....	1.50
Spring Bar, Plain.....	1.00
Body Panel Side, 1 Coat and Prim'g.....	3.00
Body Panel End, 1 Coat and Prim'g.....	1.50
Wheels Cut Down, Tire Set, per set.....	9.00
Piano Box (One Seat) with Old Irons.....	10.00
Spring Wagon Box, with Two Seats.....	12.50
Bow Sockets, each.....	1.00
Buggy and Surrey Dashes.....	\$1.50 to 3.50
Buggy Side Curtains, per pair.....	2.50
Surrey Side Curtains.....	\$5.00 to 6.00
Buggy Boots.....	1.00 to 2.00
Buggy Side Bars.....	1.50 to 2.00
Wood Buggy Bows, Put In, each.....	1.75
New Wheel, complete, C Grade, 1-inch, with New Tire, not Painted.....	5.00
New Wheel, Set, C Grade, 1-inch, with New Tire, not Painted.....	16.00
New Wheel, for 1 1/2-inch, add extra, per set.....	1.50

New Wheel, for 1 1/4-inch, add extra. per set.....	\$3.00
Buggy Seat, one New Side.....	.75
Buggy Seat, one New Back.....	1.25
Buggy Seat, one New Piece in Seat Frame, each.....	.75

Plow Work

Plow Beams, one Horse.....	\$2.50
Plow Beams, two Horse.....	3.00
Plow Beams, three Horse.....	3.50
Setting Plow Beams.....	1.00
Plow Rounds, each.....	.25
Plow Handles, Straight, each.....	1.00
Plow Handles, Bent, each.....	1.25
New Cultivator Single-tree, each.....	.35
Polish Plow, complete.....	\$1.00 to 1.50
New Land Side Plate.....	1.50
New Iron Land Side.....	1.00
New Cross Clevis.....	.35
Plow Eveners, Wood.....	.50
Plow Single-tree, Wood.....	.40
Sharpen Pulverizer, per disc.....	.25
Pulverizer Tongue.....	2.50
Four Horse Pulverizer Eveners.....	1.50
Standing Coulter for Breaking Way.....	.75
Re-stubbing Riding Plow Axle.....	1.00
Riding Plow Tongue.....	2.00
Sharpening Harrow Teeth, each.....	.02
Take Out and Put In Harrow Teeth, each.....	.02
Sharpen Seeder Teeth, each.....	.10
Sharpen Drill Shoes, each.....	.20
Sharpen Road Grader, each.....	3.50
New Lay, 12-inch, Crucible Cast.....	3.25
New Lay, 14-inch, Crucible Cast.....	3.75
New Lay, 16-inch, Crucible Cast.....	4.25
New Lay, 18-inch, Crucible Cast.....	4.75
New Lister Lay, Crucible Cast.....	4.25
Add 50c each, net, where soft center lays are used.	
Point and Sharpen Lay, each.....	1.00
Point and Sharpen Lister Lay, each.....	1.25
Sharpen Lister Lay.....	.50
Sharpening 12-16-inch Lay.....	.35
Sharpening 18-20-inch Lay.....	.50
New Cultivator Shovels, 4 in Set, Crucible Cast.....	3.50
New Cultivator Shovels, 6 in Set, Crucible Cast.....	4.00
Point and Sharpen Shovels, 4 in Set.....	2.00
Point and Sharpen Shovels, 6 in Set.....	3.00
Sharpen Set of 4 Shovels.....	.75
Sharpen Set of 6 Shovels.....	1.00
Land Side Plates.....	1.50
Land Side, Heeled.....	.50
Stalk Cutter Blade.....	.50

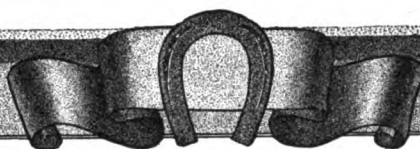
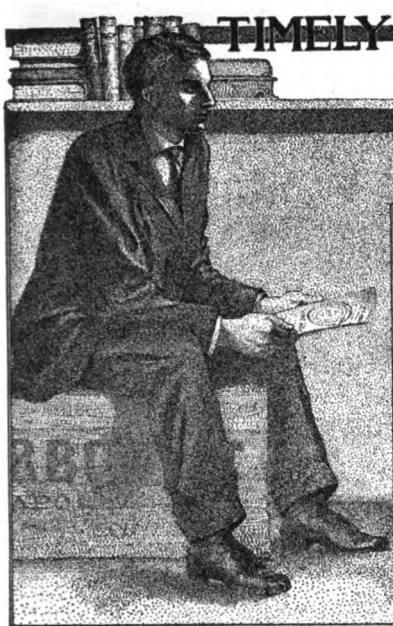
Sled and Sleigh Work

Pole, Flat, Replaced.....	\$3.75
Pole, Square, Replaced.....	3.75
Roller, Replaced, per pair.....	2.00
Bench Beams, each.....	3.00
Reach or Short Tongue.....	1.00
Bolster.....	2.25
Runners up to 2 x 4 inch, Old Irons, ea.....	3.00
Shoes, New, Put On, Steel, each.....	2.00
Beams Put In, each.....	2.50
Knees Put In, each.....	1.00
Raves, each.....	1.00
Shoes, Cast, Put On, per set.....	7.00
Putting On Cast Shoes, one.....	1.50
Sled Stakes, each.....	.25

Mower Repairs

Welding Pitman.....	\$.75
New Hook on Pitman.....	.75
Putting Straps on Wooden Pitman.....	.25
Welding Sickle for Mower.....	1.00
Welding Sickle for Binder.....	1.25
Odd Work, per hour (Stock Extra).....	.60
New Sections, each.....	.06
Putting Sections On, each.....	.03
Filing Harvester Sickle.....	.75
New Guards, each.....	.30
Sharpening Guards, each.....	.03
New Guard Plates, each.....	.06
Putting Plates On, each.....	.05
Taking Off Guard and Putting Back On, each.....	.05
New Mower Tongue.....	4.00

TIMELY TALKS WITH OUR SUBSCRIBERS



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The Advertising Pages

Here's a letter from a reader located in Australia that demonstrates stronger than anything we can say the value of the advertising pages:

"I am not a blacksmith, but an engine fitter. I work for a firm in Melbourne who deal in motor engines and machines. I have a workshop at home as a hobby. It is fitted with a Wiley & Russell drill machine, a small lathe of my own make and a small petrol engine. I cannot say enough of the help I have received from THE AMERICAN BLACKSMITH."

D. GRIEVE, Canterbury, Australia.

Here is a reader who is simply interested in "Our Journal" because of a hobby, yet he has purchased goods advertised in THE AMERICAN BLACKSMITH, and is just as much interested in the pages of "Our Journal" as though his lifework were smithing. AMERICAN BLACKSMITH readers are readers of AMERICAN BLACKSMITH advertisements; AMERICAN BLACKSMITH readers buy from AMERICAN BLACKSMITH advertisers.

The Prize Contest

We have already received quite a number of letters for entry in that prize letter contest. If you haven't yet sent in your letter, do so now—don't wait until the last minute. Write a letter now. Read the few simple conditions of the contest on page 179 of this issue. The prizes are worth writing for, and you have just as good a chance as anyone else to win. Why shouldn't you be the lucky one? The first prize is real money; the second a real watch, and the third a real fountain pen. All the prizes are guaranteed—the money by Uncle Sam, the watch by a big maker of watches, and the fountain pen by one of the largest makers of high-grade fountain pens.

Subscription Agents

When a stranger solicits your subscription to THE AMERICAN BLACKSMITH, or any other publication, insist upon his showing you absolute proof that he is an agent in good standing and is employed by the publication which he represents. Don't, under any circumstances, give the man your money if you are not sure that he really works for the paper he says he does. No matter what the man offers you—no matter what price he makes—no matter what premium he promises to send—DON'T GIVE HIM YOUR MONEY IF YOU ARE NOT SURE.

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The March Frontispiece

The Wilson-Taft picture which appeared as the frontispiece in last month's issue deserves a word or two of explanation. As announced in the title of the picture, the photograph was taken just before the inauguration of President Wilson on March 4th. The picture was printed, developed and a short description of it written and placed in the mail. At noon the next day—March 5th—the picture with the photographer's description of it was received at our offices. The afternoon of the same day the photograph was turned over to our engravers who made a half-tone plate on copper. This plate was delivered to our printers at noon on March 6th, and at exactly three o'clock in the afternoon of the same day a completed paper, containing the picture as a frontispiece, was on the Editor's desk. Just two days—forty-eight hours after the photographer pressed the button on his camera in Washington—a complete paper containing that same picture printed as a frontispiece was bound and delivered.

This, we believe, gives THE AMERICAN BLACKSMITH the distinction of being the only monthly publication to carry a picture of the recent presidential inauguration in its March issue.

Old and New Alike

Here are two letters which show how both old and new subscribers regard "Our Journal." The first letter is from one of our new folks away down in South Africa. This subscriber writes:

"Please find enclosed money order for another year's subscription. I have been receiving it now for twelve months—it is a valuable and very interesting journal."

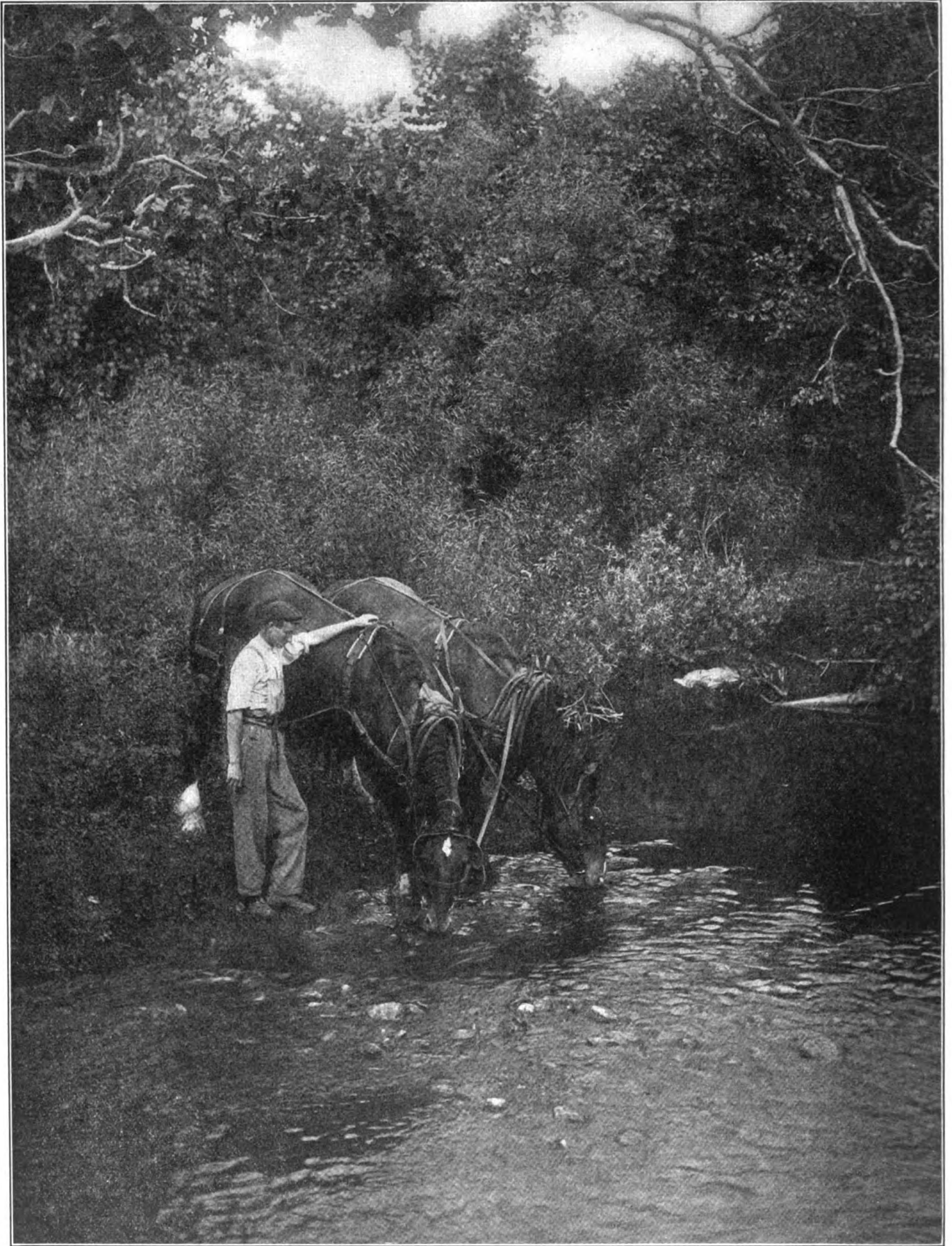
T. H. PHILLIPS, Cape Colony.

The other letter is from a subscriber nearer home. He has read the paper for enough years to know whether or not it is of benefit to him. He says:

"I have taken the paper for nine years and can hardly wait until it comes each month. I could not do without it."

C. C. BUDMAN, Pennsylvania.

Is there any question of doubt regarding the value of such a paper? Whether a craftsman is located in South Africa or Pennsylvania, in Alaska or Hawaii, in England or Australia, if he is using a forge, if he is heating iron, if he is interested in smithing or any allied trade he will find "Our Journal" useful, interesting and valuable. Tell your neighbor.



MAN'S MOST FAITHFUL HELPERS



The Proper Shoe for the Foot

Its Weight and Form and Its Relation to the Health of the Foot

L. H. BENHAM



CORRECT shoeing depends upon correct shoes. If the foot is not fitted properly

with the proper shoe, all the knowledge and science brought to bear on the paring and preparation of the foot will be for naught.

At best, the shoe as a support and protection of the horse's foot is far from ideal. It is, however, an absolute necessity, and it is therefore the work and business of the shoer to see that the shoe is made as nearly correct as possible.

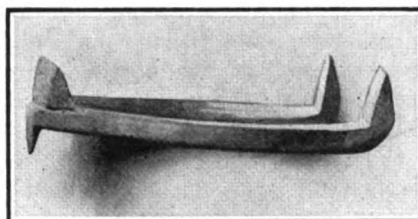
Now comes the question: How can we make this support and protection of the horse's foot as nearly ideal as possible? What factors must we consider?

First, there is the form of the shoe to consider. It should follow as closely as possible the shape of the foot. There are exceptions, of course, when the foot is diseased or irregular in form and the shoe is shaped so as to produce certain desired results; but when the foot is healthy—and in this article we are talking about shoeing the healthy foot—the shoe should follow the outline of the foot as closely as possible.

And as a difference is found in right and left feet and, of course, in front and hind feet, we must shape shoes accordingly. Some shoers say no differences may be made in right and left shoes, but if we find differences in the feet themselves, need we go further for proof?

The next factor to consider in the making of a shoe is its weight. The lighter a shoe can be made the better. But this matter of weight cannot be finally decided in just this off-hand

manner. The question of wear and of hoof preservation must be considered in connection with weight, for we know that the too frequent removal of the shoe injures the hoof. Therefore we must gauge the weight of the shoe to such a nicety as to get just there required wear with the lightest possible weight. And weight is not always an indication of the wearing qualities of a shoe; for a light shoe may have its weight so distributed as to wear even longer than a shoe containing twice the weight of metal but not distributed to best advantage.



SHARP CALKED SHOE WITH CLIP

Another disadvantage in the use of heavy shoes is the need of large nails in order to hold them firmly to the feet. The smallest nails consistent with the weight of the shoe are best from every standpoint. The large nail makes a large hole in the hoof and is more inclined to break and split the hoof than the small, thin nail.

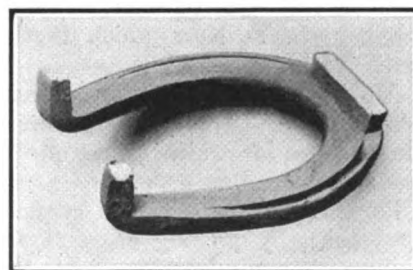
The heavy shoe also tires the horse quickly, and is another argument in favor of light shoes. Then, too, a tired animal will wear his shoes down quicker than an animal that is fresh and active. Then, again, one horse will wear his shoes away at certain points before other parts of the same shoe show any considerable wear. This gives the shoer a chance to demonstrate his knowledge in a practical way by so distributing the metal and weight of the shoes as to

get the animal to wear his shoes more nearly uniform.

Now as to the width of the shoe, not the width from the outside of one branch to the outside of the other branch—the hoof determines that—but the width of the metal itself from inside to outside. What is to determine this? The bearing surface for the wall should be as wide as the wall, so that the wall bearing surface may have support for all of the space nature intended it should have. But it is unnecessary to make that bearing surface any wider. There is no reason for it and several reasons against it. The shoe bearing surface that is wider than the wall bearing surface offers a place for the retention of dirt, stones and snow. If the metal of the shoe is no wider than is necessary to provide a proper bearing for the wall, the danger of stones, dirt and snow lodging in the foot is minimized.

Then there is the thickness of the shoe to consider. The foot should not be raised from the ground any more than is necessary in order to get the proper amount of metal under the foot. It is a decided disadvantage to the foot to raise it unduly high above the ground.

The time usually considered correct for which to allow a shoe to remain on the foot is about four



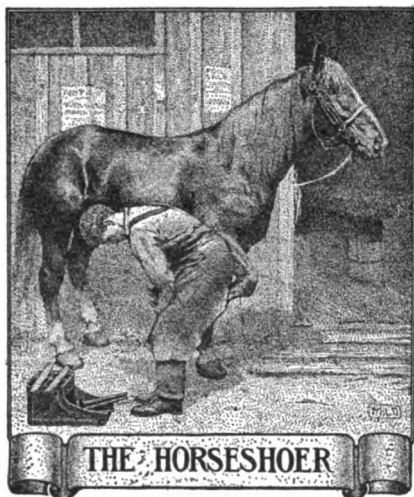
SHOE WITH BLUNT TOE AND HEEL CALKS



weeks. And in towns and cities, where a horse travels over hard pavements, this is seldom exceeded. But the country horse-owner is tempted to let his horse go unduly long without a resetting, as the shoes will often go as long as five and six weeks before being badly worn. This, of course, causes the hoof to grow beyond the shoe, and often leads to foot troubles caused by the unnatural foot bearing and balance.

It is well for the shoer to remember that the office of the shoe is to protect the foot. Any metal in the shoe in excess of that required to perform that protection is unnecessary and a positive detriment.

The shoes shown on these pages are simply examples of good work. The shoes are for no special purposes, nor to perform any special office, except that of protecting the foot. The calks, as will readily be seen, are sharp, high blunt and low blunt. The shoes are all well turned, neatly made, and may generally be considered good examples of good horseshoe turning.



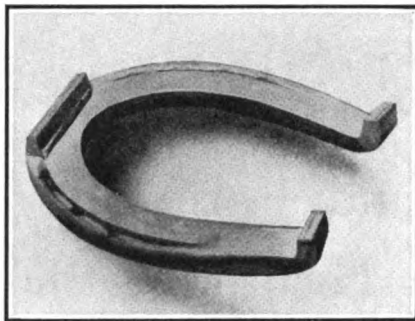
The Bar Shoe Versus the Three-Quarter Shoe

FRANZ WENKE

A great many horseshoers have used the three-quarter shoe, and also the bar shoe. Now which is the best?

After trying both for years, I have found that the bar shoe best answers the purpose for which either one is used.

For instance, a foot with a quarter crack; by putting on a three-quarter shoe we take the pressure off the quarter with the crack, but at the same time we put a strain on



THE SHOE IS A PROTECTION AND A SUPPORT

the same quarter and to some extent on the ligaments and the whole column above the foot except in the case of a very flat foot. But if the foot is very flat, then our aim—to protect that quarter—will be minimized, as the horse will surely put its weight on the injured quarter, more or less, especially on soft ground. If the foot is more steep, and the ground hard, a strain on the side where the branch of the shoe has been removed will result with every step the horse takes.

For instance, suppose the inside of a foot is afflicted with a corn, and the branch of the shoe is cut off at about the fourth nail-hole, the animal has now to step on only three quarters of its bearing surface unless the ground is soft and the foot flat. In this case the aim of the three-quarter shoe is lost, as the pressure will again be on the corn or quarter-crack when the foot sinks into the ground. And again, if this happens to be the case on the outside of the foot, especially on a draft animal—most draft horses or mules put more weight on their inside walls, as can be seen every day by the wear of their shoes. In that case the strain and the bruising of the afflicted part will be even more evident than would be the case of the inside quarter.

Now take the bar shoe; a properly fitted bar shoe will give an even tread to the whole column above the foot, and at the same time will protect the diseased part from coming into contact with the ground.

I have found it a very good plan to cut the hoof where the corn or crack is located as much as possible without drawing the blood, and rivet a piece of rubber hose (or other rubber) just enough to fill out the gap caused by cutting the hoof, but not enough to cause any pressure on the

diseased part. In the act of stepping, the rubber will meet the hoof above and thus lessen the concussion and also the strain on that part. At the same time it will tend to exercise the affected part slightly and keep the blood in circulation and also prevent atrophy.

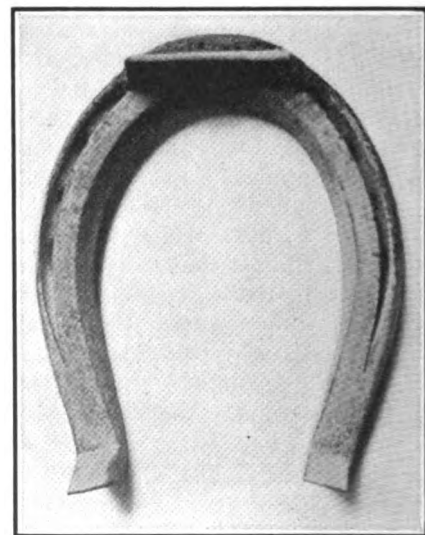
The bar shoe itself will give an even tread to the whole column and do away with a wobbling and rolling motion of the foot as seen in most three-quarter shoes which only tends to fatigue the animal.

Shoeing to Cure a Spavin

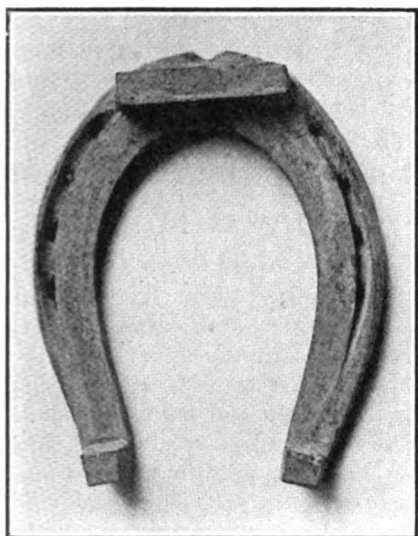
DR. JACK SEITER

To a recent inquiry, regarding the treatment of a spavin, the treatment advised is as follows: Do not work the animal—allow it to rest, the longer the better. Then with the aid of cooling lotions reduce the fever, and after this is accomplished blistering and firing are indicated.

The above advice may be the proper caper as far as it goes, but it goes too far before it is really ready to start. There is nothing like a good start, and before we can recommend a certain line of treatment for any specific ailment we must find out how said ailment was brought about—the cause of it, if you please. Then, if we are able to locate the cause, the next step naturally would be to remove it. Whether removing the primary cause of the trouble will cure the ailment is immaterial and in this case quite certain, but in order to



CORRECT SHOEING DEPENDS UPON CORRECT SHOES



THE SHOE SHOULD BE NO HEAVIER THAN NECESSARY

follow a common-sense line of treatment we must remove the cause before we can intelligently attempt a cure.

A spavin is an exostosis or bony growth situated at the anterior and internal aspect of the hock, and the size of the growth naturally depends upon the time it has had to develop. At times they are not visible to the eye and are called occult or blind spavins, and sometimes they are so large that they completely incase the cushion tendon, which plays over this region, and then again it may form a complete ankylosis of the entire joint.

After the growth is once set, medical treatment beyond the use of anodynes or anodyne liniments is practically of no use, and the use of blisters and the firing iron is indicated only in the earliest stages. In fact, they are of very little use after the bony deposit has attained the growth to where it is noticeable to the eye.

There are numerous causes which are liable to bring on a spavin, natural and acquired. The periostitis (inflammation of the periosteum) is generally the seat primarily of the trouble. And the cause is invariably brought on by some form of traumatic disturbance or wound, or by strains of the ligaments surrounding the hock. A ligament may be torn from its insertion, a kick or bruise, in fact, anything that may set up sufficient inflammation will cause a spavin to develop. Consequently, a slip of the foot, either while pulling a heavy load or while at speed may be the direct cause of this trouble.

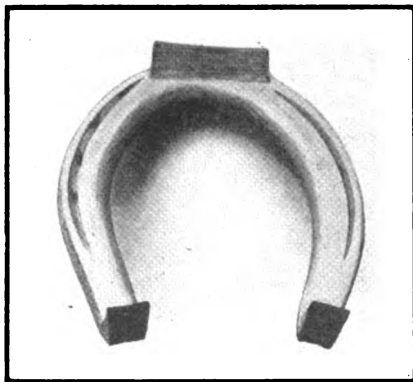
Then, again, we have causes that naturally give an animal the pre-

disposition to acquire spavins. Invariably those that have a curby conformation have this predisposition to a greater extent than those with an otherwise perfect conformation. But what I want to get at—and get at good and strong—will take me back to the head of this article, viz., the direct cause of fully 90% of all spavins. It is utterly impossible for an animal to throw out a spavin (outside of mechanical injuries) if the toes are not too long—long toes and high-toe calks are the direct cause of more spavins than all other causes put together a hundred-fold.

Naturally, if we get into trouble, we must locate the cause; if we lose a wheel off of our wagon we do not blame the wheel, but look for the nut—the direct cause. If we are troubled with indigestion the doctor does not fill us up with medicine to cure us; he finds out what we have eaten that would not agree with our system—the direct cause of the trouble; he forbids that certain food. This removes the cause—and then he prescribes medicine.

The answer to the above inquiry: The lotions and blisters and the firing iron are all indicated, but with the cause still there all the blistering and firing that may be used, only to torture the poor brute, will avail nothing, will cure nothing.

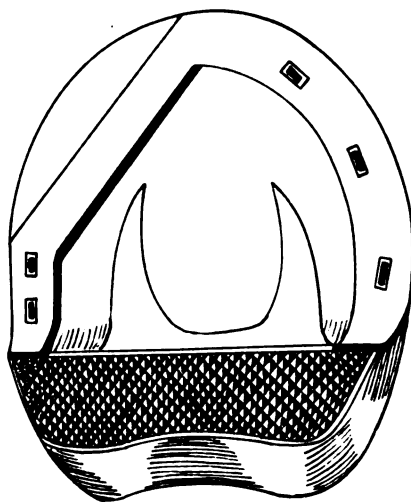
If keeping the toes short will minimize the trouble, then short toes are indicated. If long toes are the direct cause of the trouble—and there is no doubt but that they are—they must be removed, and removed before we can prescribe any intelligent or rational treatment. Cut down the toes to prevent this condition, and cut down the toes when this condition manifests itself—remove the cause and then treat.



HEAVY SHOES TIRE THE HORSE QUICKLY

There is just about as much use of treating a spavin in connection with a long toe as there would be in treating a drowning man without first pulling him out of the water.

As mechanics, we can do wonders in aiding the cure of this trouble, both in the way of trimming the feet and by applying different styles of shoes. Of course we must use our own judgment in regard to shoeing the different types of animals, and also keep in view the work that is required for each individual case. But the main point to remember is to keep the toes as short as possible, and also to construct the shoe in such a manner that the break-over at the



A THICK-HEELLED RUBBER PAD IS ESPECIALLY GOOD ON STONE PAVEMENTS

point of the toe offers the least possible resistance.

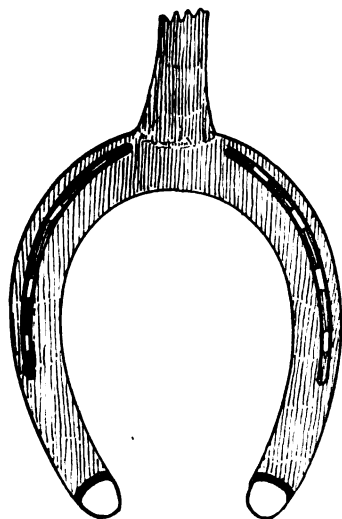
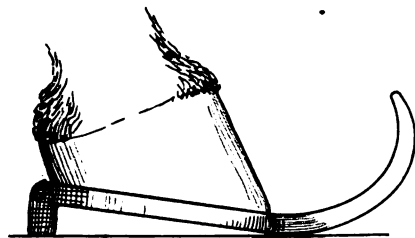
In shoeing the heavy draft horse, where toe calks are absolutely necessary, it is advisable to lower the toe all it will stand, and also lower the inside of the foot, especially toward the toe a trifle the more; then set the toe calk back as far as possible. The calk may run well over the outside of the shoe, but should not quite extend to the inner edge of the shoe. Keeping it a little lower at this point also has a tendency to relieve the strain on the affected parts. Naturally, the heel calks must be kept as high as possible.

I have had good success with the use of a good thick-heelled rubber pad, especially on stone pavements where the concussion is rather severe. They elevate the heels to the proper height, eliminate the concussion and afford a firm footing; and the prevention of an animal slipping helps



greatly in preventing strains on the affected parts.

In the shoeing of road or other light harness horses it is advisable to shoe without a toe calk, and rolling



CURING A DIFFICULT CASE

the toe of the shoe off to the inside is also indicated. Several years ago I had occasion to shoe a trotter that showed signs of spavin lameness. No sign of the spavin had yet appeared, nor was there any inflammation present, but the diagnosis of several prominent veterinarians and the manner in which the animal handled the limb left no doubt in our minds that it was a case of occult or blind spavin. The owner did not want to take the chance of blemishing the animal with caustics or the firing iron, so he was brought to me to shoe. After I had cut off the toes all they would stand I made him a pair of tips out of 1-4 by 5-8 steel and fitted them in the same manner as we fit a cross-firing shoe to some pacers. That is, the shoe did not follow the foot around the inner toe, but cut across from the second nail on the inside to the toe on the outside. This left him the whole inside of the foot without practically any bearing on the ground surface—the part of the foot that has a direct bearing on the affected part. With this tip I applied a rubber pad. This animal never took another lame step while shod in this manner, and

the following winter I shod him for the ice in the same manner, using three Neverslip calks in the tip; two on the outside and one in the center of the tip. We tried several times to shoe him with a plain shoe after this, but he would immediately show signs of returning lameness.

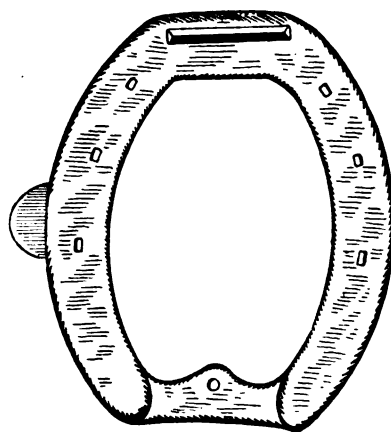
Curing a Difficult Case

L. L. K.

Some time ago a veterinary surgeon of our place was called to attend a horse that was lame in a rather odd way. The tendons on one of the hind legs had become so short that when the horse tried to put his weight on that foot the foot rolled forward and turned almost upside down.

The owner of the horse, thinking there was something in the foot, took the animal to several shops to have the foot examined. He was informed by the horseshoers that they could find nothing wrong; consequently, could do the horse no good. The horse kept growing worse each day, and at last the veterinary surgeon was called to see the animal. After looking the horse over, carefully, the surgeon requested the owner to bring the horse to my shop. I examined the animal and thought I knew just what to do to remedy the trouble. I took a machine-made shoe, that was the correct size for the foot, and then took a short bar of $1\frac{1}{2}$ by $\frac{3}{8}$ inch of mild steel. I welded one end of this to the toe of the shoe and cut the bar off 10 inches from the toe of the shoe. Then I shaped the projecting bar like the nose of a sled runner, and turned up heel calks $\frac{3}{8}$ of an inch high.

The owner led the horse out of the shop, and a week later he told



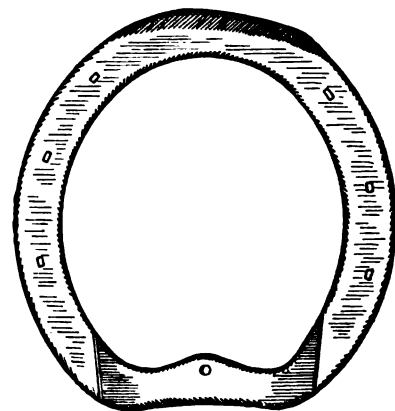
BILLY BURKE, 2.03 $\frac{1}{4}$; 5 $\frac{3}{4}$ -OUNCE FRONT SHOE; CREASED TOE; SIDE CLIP

me that the horse goes as well as he ever did. He also added that it was the cheapest and quickest remedy of which he ever heard.

Shoeing the American Harness Horse*

JAMES CLARK

The improvement that has been made in the development of the American harness horse in the last 25 years is something marvelous when we stop and consider some of the crude and, I might add, cruel methods that were in vogue a quarter of a century or more ago. But the world is growing wiser and better,



DON PRONTO, 2.02 $\frac{1}{4}$, CHAMPION FIVE-YEAR GELDING; 4-OUNCE FRONT SHOE; BEVELED TOE

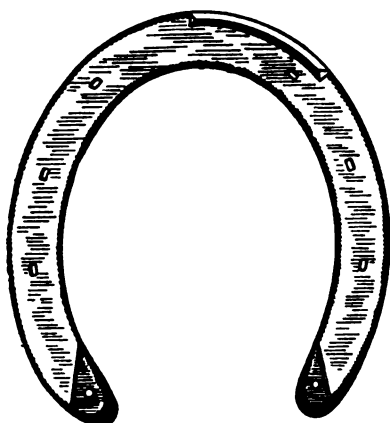
and the advantages that man enjoys now, which he did not enjoy 20 or 30 years ago, and the benefits he has reaped from the lessons learned in that time, he shares with the horse. The improvement that is by the law of nature continually going on in mankind is, in the nature of things, bound to be shared by man's best friend in the animal kingdom. The things that were good enough for our fathers and grandfathers are not good enough for us, for the simple reason that they do not and cannot be made to fit into our lives, owing to the changed and improved conditions.

We are living in a swift and a progressive age, and the laggard, either in love or in labor, has no place in the present generation, if indeed he had in any generation. One of the many things that has enabled the trotter and pacer to reach the high

*EDITOR'S NOTE—This article should be read by every shoer whether he is a shoer of speed horses or not—the article is full of interest and practical value. We acknowledge our indebtedness to *The Horse World* for this article.



standard of excellence he has attained and to gain the reputation that is all his own, is the steady and growing improvement in the art of shoeing and balancing him. Time was when very little attention was paid to the



WALTER COCHATO, 2.04½; FRONT, 7½-OUNCES; TOE CALK INSIDE

shoeing of the trotter. It was usually a case of "iron him off" and let the trainer do the rest, and a pair of scales, a foot-adjuster, a compass and rule were unknown and consequently unused in the horseshoeing department. The shoe that was the right size was the right style and weight, and that was about all there was to it. Nevertheless, there was an occasional trainer that would hand out a line of dope on shoeing them, but so different from the present-day article that it would not be recognized in any well-regulated shoeing parlor.

I stood in the doorway of a shoeing shop in Toronto, Canada, some years ago and overheard the following conversation. A floorman, calling to the head fireman from the smoky recesses of the shop, said:

"Ho, Andy! where's the irons for this wan?"

"How big is his fut, Maurice?"

"Oh, about a number foive."

"How tall is he, Maurice?"

"About sixteen, wan."

"Is he a bay, or a gray, Maurice?"

"He's a bay."

"Mare or a gelding?"

"He's a gelding, Andy."

"Has he a star in his forrid?"

"The divil a star, nayther has he a moon or a sun!"

"Alright, Maurice; here's a set of shoes that will swing that lad fine."

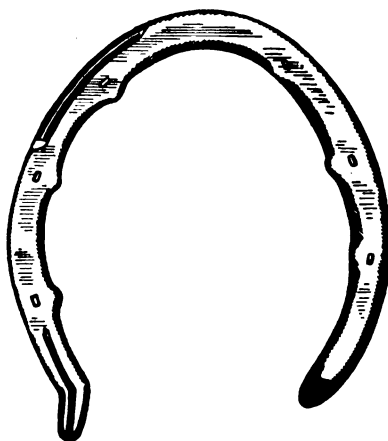
Of course, it was all in jest, but there was about as much sense in the conversation as there was oftentimes

in the "instructions" we used to get years ago, about hanging up a trotter.

Comparisons are odious sometimes; nevertheless, there is something to be learned from them at all times, and the point I want to make right here is that in this harness horse business—in every branch of it, every department—we have improved year after year. There has not been the slightest retrogression; not one step backward has the trotting and pacing horse taken since he first established his identity as a race horse and pleasure horse over 50 years ago.

We could not go back to old methods or old-fashioned ideas if we wished to; the high-bred horse we have today wouldn't stand for the application of those ideas and methods in use when the breeding of trotters was in its infancy. And so it will continue until the dawn of that last great day, until the end of time; for just so long as there's a horse left there will be a man left to care for him, and just so long as there is a man left there will be a horse—and a woman—to share the earth with him. And when the horse—and the woman—are gone, what's the use of the man staying on earth?

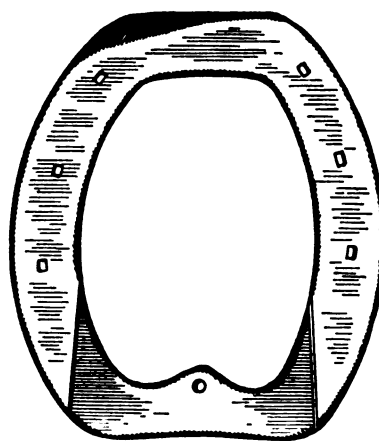
But let us go back to the shop and do a little work. I attended a horsemen's banquet in Chicago last spring, when a young turf editor made what I considered a very clever and appropriate speech. Another young turf scribe who had an impediment in his talking machine "complimenting" his co-worker the following week in his paper, said "he did the best he could." Now that expression about sums up this horse business from the beginning to the present time. The old-time trotter, the old-time trainer and the old-time "village black-



WALTER COCHATO, 2.04½; HIND SHOE, 3½ OUNCES

smith" all "did the best they could," and that's all we can do in this day and generation, and as long as we do that the world will look on and approve and applaud.

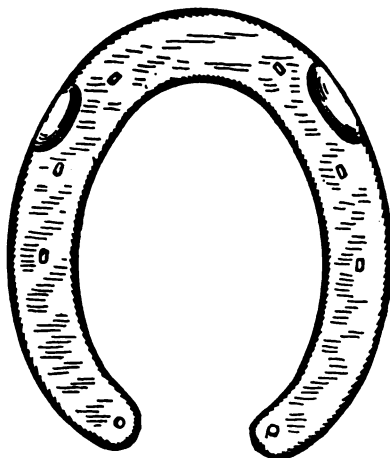
The one best bet today on the race-track, or off it, is the skilled horseshoer. When Mr. Geers or Mr. Murphy, or any of the leading lights of sulkydom, get a new horse in the stable, about the first question asked is, "How is he shod?" and after the wizard of the reins has given the new candidate a tryout he can possibly detect some little flaw in his way of going that he can remedy by shoeing, thereby improving him perhaps only a fraction of a second; but fractions count, and the next morning you will see him in the horseshoeing shop being made over.



BADEN, 2.05½; BIGGEST MONEY-WINNING TROTTER; 8-OUNCE BEVELED, OUTSIDE TOE

It requires a lot of patient, diligent study, this proposition of shoeing and balancing racehorses, if you want to make a success of it, no matter whether you are owner, trainer or horseshoer. If you were going to race over one track all summer with just one or two good horses and they remained sound and the weather was good every day, so that there could be no possible difference in the track from one week's end to the other, and the central figure in all of your dreams did not get stale, or sick or going bad-gaited, and would "win a main" for you occasionally, and you had foresight enough to have a few tickets against him every time he got beat; say, life would be one long, sweet summer night's dream, wouldn't it?

You will quite often hear a trainer say "All tracks look alike to this fellow," but do they? Does it stand to



ESTER W., 2.06 $\frac{1}{4}$; FOOT SURFACE
OF FRONT SHOE, 8 OUNCES

reason that a horse that will go in 2.10 over a smooth, velvety track can give you his best efforts over a deep, sandy, tiring track without some change in his shoeing or some assistance from both trainer and shoer? Hardly! A horse that will go good-gaited and race gamely over a smooth, firm track will go sprawling-gaited over a loose, sandy track and, tiring at the end, will create the impression among spectators not acquainted with the conditions that he is a rank counterfeit.

Well, what are you going to do about it? Just shoe him for the occasion, that's all. Perhaps shoe him with low, sharp calks; maybe a rim or a half-rim shoe; perhaps a sharp, swedge-shoe. That's where the skill and judgment of the shoer is brought into play. How often do we hear a man say:

"I don't believe my horse will go good over this hard track. I am afraid it will sting him."

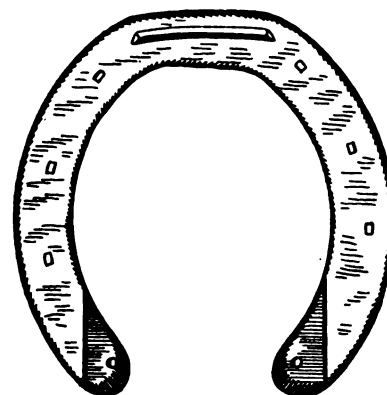
How would it work to have the equine chiropodist fix him up so that

the track would taste soft to him, whether it was or not? Supposing he does carry a few ounces more weight? What's the difference as long as he goes free and does not change or shorten up in his stride?

Some thoughtless persons get the idea that when a pad is put on for a hard track, and the horse performs well with it, that it is the increased weight of the pad that balanced him and made him go good, while in reality it is the protection the pad affords him that makes the marked improvement. Anvil, 2.06 $\frac{1}{4}$, Mr. Geers' good winner of 1912, won very impressively at Lansing, Mich., early in July over a soft track, and a number of wise people who keep a close watch of such things and make a study of form, bad tracks and good horses, rendered the verdict that when he performed on a hard track like that of Grand Rapids he would "jump," for the reason that he had bad feet and the hard track would sting him. When he started at Grand Rapids, however, Fred Cope, who has presided over Mr. Geers' shoeing annex for several years, had Anvil's feet so well protected with leather and oakum and all of the garnitures that belong to a scientific application of the farrier's art, that Anvil failed to detect the difference in tracks; he failed to show any indications of having bad feet or bad manners; and that one incident explains in a nutshell the benefits to be derived from the intelligent and timely application of a little common sense.

The pictures of shoes that appear in connection with this article are fac-similes of the shoes worn by these different horses when they were performing so brilliantly on the Grand Circuit the past season. There is a similarity among them; also, there seems to be very little difference between the shoes worn by the trotting champions and those worn by the pacing brigade, but out of the big array of cuts presented here can you pick two shoes from different horses that are identical?

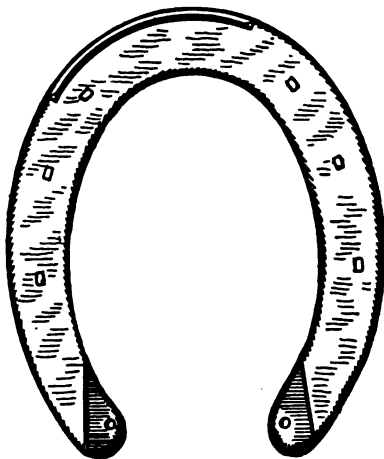
The difference in the style and weight of shoes worn by the biggest money-winning trotter, Baden, 2.05 $\frac{1}{4}$, and the biggest money-winning pacer, Joe Patchen II, 2.03 $\frac{1}{4}$, seems trivial to the uninformed, but put Baden's shoes on the Patchen horse and Patchen's shoes on Baden, and it would be a safe assertion to make



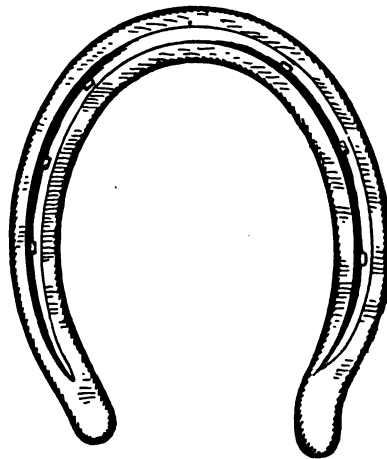
LEWIS FORREST, 2.06 $\frac{3}{4}$, TO POLE,
2.03 $\frac{1}{4}$; PLAIN 3-CALK SHOE;
RIM PACK; 7 $\frac{1}{2}$ OUNCES

that the monetary loss to the owners of the two horses would have been something enormous, to say nothing of the loss of prestige that two such performers give to the harness horse world. These shoes as here shown do not look to be very much out of the ordinary, but how many different kinds of shoes has each one of these noted performers worn, do you suppose, from the time his owner and trainer first started him—or her—on the road to fame? Have you any idea of the number of times the Canadian reinsman, Havis James, changed the weight and style of shoes on Joe Patchen II before he finally adopted the shoes that he wore in his victorious campaign of 1912?

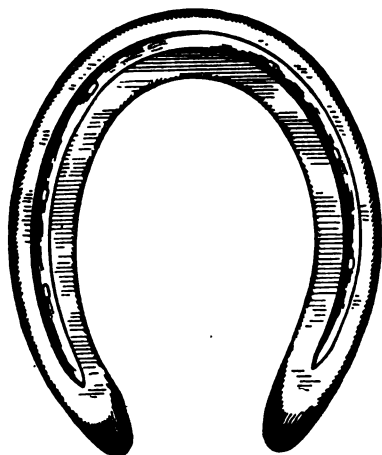
I wish I knew! Of course, pacers like Joe Patchen II don't require much experimenting on, but, nevertheless, while his great speed was being developed there was a constant evolution going on in his gait; for as a horse gains in speed development his gait necessarily changes; and these differences are noted by the wizard in the sulky and promptly



JOE PATCHEN II, 2.03 $\frac{1}{4}$; 9-OUNCE
FRONT SHOE, SET CALKS; RIM
SET AROUND INSIDE



JOE PATCHEN II, 2.03 $\frac{1}{4}$; 4 $\frac{1}{2}$ -OUNCE
SWEDGED HIND SHOE, NO
HEEL CALKS

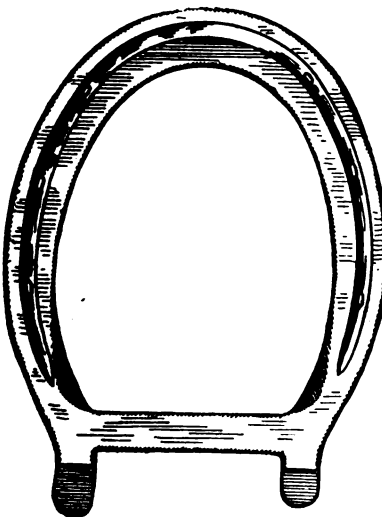


**IMPETUOUS PALMER, 2.05¼; 9-OUNCE
FRONT SWEDGE SHOE**

met by proper and intelligent shoeing, until in the opinion of his trainer he has reached the very limit of his capabilities.

Joe Patchen II wears a nine-ounce shoe in front with low, sharp-set calks and also a low circle grab set to the inside of the center of the toe. This style of grab was put on after his race at Fort Erie last August in which he hit his knee when he made a break, something he had never done before, and the wisdom of making this slight change in his shoes was apparent in the weeks that followed, for the big pacer not only went clear of his knees, but won every heat in every race he started in during the balance of the season.

Baden, 2.05¼, the horse that won over \$35,000 on the Grand Circuit during the season of 1912 and was sold for export for nearly that amount, wore an eight-ounce bar shoe with set calks; the toe of the shoe was slightly squared, and from inside the

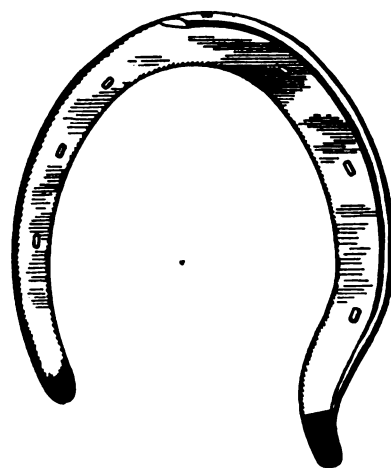


**MANRICO, 2.07¼; WINNER KENTUCKY
FUTURITY; 4-OUNCE HIND SWEDGE
BAR SHOE**

center of this square the toe or outside corner of the shoe is slightly beveled. Baden is not a horse of excessive action; in fact, he has not a bit of what is usually called "waste action," either in front or behind. He has a smooth, resolute, frictionless way of going, and the slight roll in the toe of his shoe enables him to break over just where he wants to.

Mr. A. S. Rodney, the clever young trainer who brought Baden out and who has driven him in all of his races during his career, had a lot of trouble in getting the son of Bingara hung up just right, and while the shoe as it appears here looks simple enough, it is, nevertheless, the result of months of hard study and experimental work. Under this shoe, Mr. Rodney usually used a rim pad of leather. Mr. Rodney, like the great horse he drove, is a graduate from the half-mile tracks, and the lessons he learned on the "double-o" tracks he learned well.

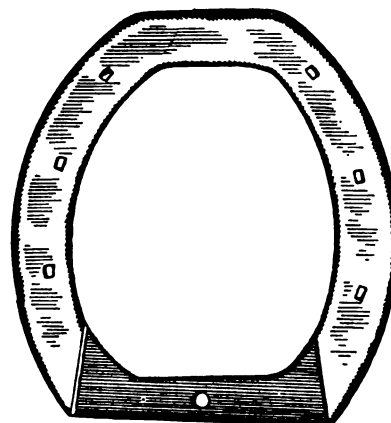
Manrico, 2.07¼, that wonderful three-year-old trotter that won his record in the sixth and final heat of the Kentucky Futurity last October, fighting out to the last stride the bitterest three-year-old contest ever witnessed, wears but seventeen ounces of steel altogether, his front bar shoes weighing four and one half ounces each, and his hind shoes—which are of the swedged-bar variety—weighing four ounces each. Manrico is what might be called a rapid-fire trotter, and when in action is one of the busiest pieces of machinery you can imagine. He goes with a very short toe and a high heel all around, the toes of his front shoes being squared, and the lateral part of the shoe is a trifle wider in the web; this being done so as to make a wider base for the leather or aluminum that was sometimes used to build up his heels. The fact that Manrico wore his hind shoes out entirely at the toe explains why it was necessary for him to wear a bar shoe behind. It doesn't take but a few days for a horse that lands on his toe, especially his hind toe, to weaken the shoe to such an extent that it will spread at the heels unless it is held together with a bar. It looks easy enough, doesn't it, when it's explained? But how many councils of war do you suppose the great California reinsman, Will Durfee, held with his shoeing artist, Walter Cleveland, before Manrico was "hung up" just right?



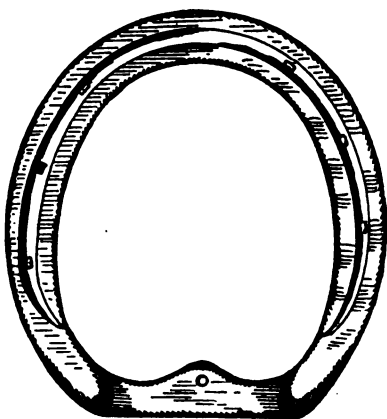
**IMPETUOUS PALMER, 2.05¼; 3-OUNCE
HIND SHOE; FULL SIDE RIM**

While you are trying to figure it out I'll tell you a few things about Mr. Durfee's other champion, Don Pronto, 2.02¼. While the majority of pacers prefer—in fact, require—a little grab or toe-hold of some kind, although on some occasions it is very slight, Don Pronto was at his very best when his front shoes were beveled off at the toe and his heels were slightly elevated and adorned with a sharp calk. His action all 'round is uniform and very rapid, and anything like a sharp-toed shoe or a grab or toe-calk that would interfere with his revolutions would naturally throw him off his balance.

Evelyn W., 2.00½, the invincible little pacing whirlwind, is one Grand Circuit lady that gets a new set of footwear every week that she races. Evelyn wears a swedged bar shoe in front, with a light pad weighing five and one half ounces, and behind she wears a swedged open shoe, weighing about three and one half ounces. She likes the sharp grab or hold that the swedged affords; it seems to steady



**MANRICO, 2.07¼; 4½-OUNCE SQUARE
TOED BAR SHOE**



EVELYN W., 2.00½; 5½-OUNCE
SWEDGE SHOE

her and give her confidence; consequently, her long time driver, Mayor Shank of North Randall, O., who cares nothing for expense, has the little pacing wonder fitted out in the same way just previous to her every race.

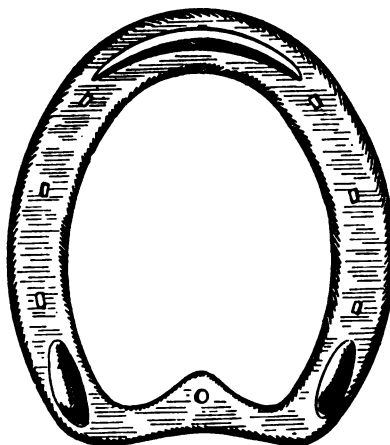
When the story of the 1912 Grand Circuit is placed in the book of history one of its brightest and most interesting pages will be the one relating to the performances of the great four-year-old pacing champion, Braden Direct, 2.02¾. Braden's front shoe weighs only four and one half ounces with a light rim pad. He likes the circle grab on the toe; in fact, I guess he likes everything he wears, judging from the way he raced all through the season. His toes are very short all 'round, just a shade under three and one half inches, and his hind shoe is a very light, swedged pattern, weighing three ounces.

Billy Burk, 2.03¼, the fastest trotter stallion of the year, wears a bar shoe that weighs five and three quarters ounces, perfectly plain with the exception of a slight double crease or corrugation at the toe. Billy lands with considerable force on the outside of his front shoes, and a side-clip is drawn up to prevent the shoe from being forced out of place. His front toes measure three and seven eighths inches, and the angle of his front feet is 45 degrees, which is about two and one half degrees below what is generally conceded to be the standard or average angle.

Esther W., 2.06¼, wears about the, simplest piece of foot jewelry of any of the fast trotters of the year. The cut shows the cut or inverse side of her front shoe, which weighs eight ounces, with a clip on each side of

the forward quarters of the foot to prevent her from driving it back.

The cut of the hind shoe worn by Earl, Jr., 2.01½, which weighs three and three quarter ounces, is an illustration of a shoe that is worn by a great many fast pacers, especially by those that are liable to crossfire. It is well to state that this same style of hind shoe is used on many trotters. Next in order comes the hind shoe of that other great four-year-old pacer, Walter Cochato, 2.04¾ (that was raced so successfully by the Indiana reinsman, Harry Snyder, the past season), made in a different form, but to serve the same purpose—to prevent crossfiring. Walter's front shoe is made on the order of Joe Patchen II's front shoe, only the toe-grab is shorter and it is one and one half ounces lighter.



UHLAN, 1.58; 6-OUNCE BEVEL-EDGE
BAR SHOE; TAPERED BLUNT
CALKS; CREASED TOE

Another style of crossfiring shoe is the one worn by the champion three-year-old pacer, Impetuous Palmer, 2.05¼, that cyclone that came out of the West and swept away a world's record that had stood for many years. This is a sharp rim from the center of the toe to the block heel and is brazed on instead of being swedged out of the shoe. This shoe weighs but three ounces. In front, the champion wears a deep-swedged shoe, weighing four ounces.

Baldy McGregor, 2.06¼, wears the shoe with the bar brazed across the heels, and the corrugated toe; the object being to quicken his action without interfering with his stride. Baldy used to scalp and speed-cut, but after being rigged with this pattern of footwear he went clear. The bar, as applied, raises the heel about three eighths of an inch, and the

additional weight it adds to that part of the shoe quickens his action in the break-over, causing him to fold higher, while the slight hold he obtains from the creased toe is beneficial on the reverse motion of the foot.

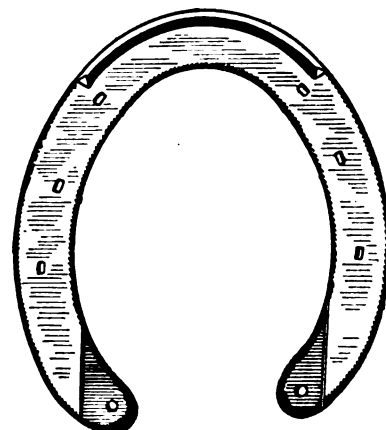
Uhlán, the fastest trotter in the world, wears a bar shoe weighing six ounces, fitted with a thin pad of leather. On the heels are flat, tapered calks, and the toe of the shoe has the double crease or corrugation.

Lewis Forrest, 2.06¼ to sulky and 2.03¼ in double harness, wears a seven-and-one-half-ounce shoe in front with low, sharp-set calks on the heels and a straight, sharp toe-calk; the shoe's edges are well beveled and a light pad completes the front equipment of the gelding who was Uhlán's team-mate when the world's record for a team was placed at 2.03¼ at Lexington last October.

The success of the shoer depends very much on his judgment and skill in selecting the right pattern of shoe and the preparation of the foot that is to receive it, for I have always maintained that there is as much benefit to be derived from the proper preparation of the foot for the shoe as there is from the shoe itself.

Horseshoeing in Germany

The general character of the ordinary blacksmith shop in the neighborhood of Hamburg is very similar to that of like establishments in the United States. The shops are usually small and furnished with bellows, anvils and tools of ordinary type which call for no special description. Upon the passage of the law of July



BRADEN DIRECT, 2.03¼; 4½-OUNCE
SHOE; SET CALK; RIM TOE



1, 1883, governing the practice of the trades, it became necessary for farriers throughout the Empire to pass an examination proving their efficiency. The effect of this legislation has been favorable to the development of schools for farriers which prior to that date were connected with veterinary colleges. The first farriers' schools in Germany were established in the Baden army administration, and similar schools were afterwards organized in the military administrations of other States. At a later date schools for the instruction of civil farriers came into existence. There are now 70 such schools established throughout the Empire, most of them being private enterprises, but many are also supported by agricultural associations. The course of study lasts from one to six months and is attended by 2 to 30 students.

Horseshoes of German make are almost exclusively used, but Swedish nails are preferred, as they are said to be tougher than those of German make. German horseshoeing methods have undergone no changes whatever in recent years. Patent horseshoes are offered for sale from time to time, but make little headway, farriers preferring to cling to the old method of forming their horseshoes individually.

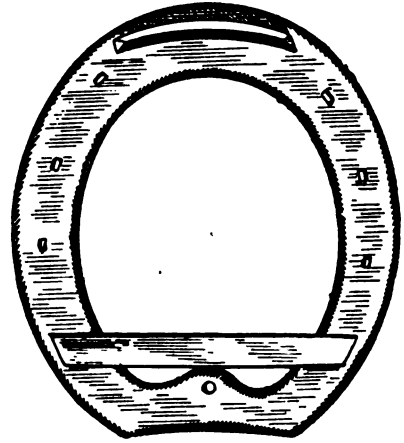
The farriers' school in Breslau is one of the best in the empire. It was established in 1867 by the agricultural societies and is under the direction of the Silesian Chamber of Agriculture. Pupils vary from 19 to 45 years of age and about 20 are instructed at a time. Over 3,000 have been trained in the school. Pupils are trained in four to six

weeks, according to the English system, introduced into Germany by Count Einsiedel. In every part of Silesia are blacksmiths skilled in the English method, and the results have been so gratifying that many estate owners and farmers' unions are furnishing apprentices and even masters with the means of attending the horseshoeing school in Breslau. The best workshops in Breslau have plenty of space, light and air, modern apparatus and tools and an open hearth. The school smithy makes the special shoes from malleable cast iron, produced at the mines of Upper Silesia. The ordinary shoes, also of German make, are purchased from Breslau dealers. Genuine Swedish nails are used.

In Magdeburg, practically all of the blacksmiths of the city and vicinity are members of a society from whom all supplies are secured.

A yearly membership fee of 100 marks (\$23.80) is paid, and at the end of the year a dividend is declared and credited on the account of the year just ended. This dividend is at least 6 per cent, often more, which in addition to the benefits of cheaper prices, owing to large quantities being purchased, much more than reimburses the individual members for their dues. Most of the supplies used in this immediate vicinity are purchased by the society in Thale am Harz.

The tools used in the vicinity of Nuremberg are all of German make, but there is no objection to first-class American tools. There are two large horseshoe-nail factories in Germany which supply this trade, namely, Moeller & Schreiber in Berlin, and Nagelfabrik Bergedorf, in Bergedorf, near Hamburg. Staff iron and horseshoes are obtained from the factory of W. Ernst Haas & Son, in Neuhoftnungshutte be Sinn, Hessen. The firm governing the sale of anvils in Germany is Verband der Amboswerke (Associated Anvil Manufacturers) in Hagen, Westphalia. None of the foregoing firms sell direct to the horseshoers, only through one of the local wholesale dealers. The finer tools, instruments and appliances used by the horseshoers are supplied by the firm of H. Hauptner in Berlin. Paste and shoe grease are supplied by the firms of Bengen & Co., Hanover, and Bernhard Vogeler, Erfurt. Bituminous coal used



BALDY MCGREGOR, 2.06½; 9-OUNCE BAR SHOE; CORRUGATED TOE AND MEMPHIS BAR

is obtained from the Ruhr district in Westphalia.

Local wholesale dealers and importers in Nuremberg who supply the trade here to some extent already deal in American tools and machinery. Johann Brodwolf, Rothenburger Str. 55, is a licensed horseshoer and the teacher of the state school for horseshoeing at Nuremberg. He uses, for instance, American rubber layers which are put between foot and iron, and is always ready to try and use new tools and appliances.

The smithing coal used by the German craftsman is generally mined in Westphalia. From here he also secures his iron. Nails are generally imported from Sweden, though some shoers object to the Swedish nail because it bends more easily than do others. Nails are also manufactured in Berlin and others are procured in Bohemia.

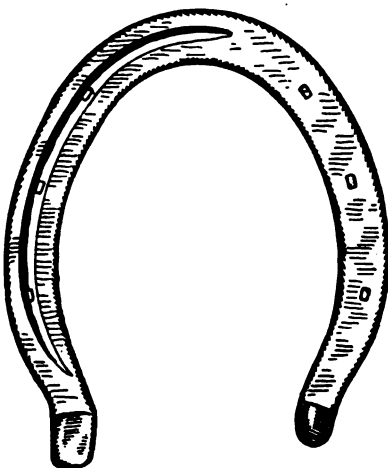
Floating the Sinking Fund

BY THORNTON

Part 2

Of course if a man puts nothing into his business he cannot hope to get anything out of it. Nor is he one bit better off when he puts everything into his business and gets nothing out of it. So, after all, the only thing that counts is what you get out of your business and, as I said before, the time to get anything is when the getting is good.

Before I started out on my own hook I got from eighteen to twenty-two dollars a week. When I opened my own shop I figured that I was



EARL, JR., 2.01½; 3¾-OUNCE HIND SHOE; CROSS FIRE, HALF SWEDGE



worth at least twenty dollars, and I hired myself at that figure. Some of those first weeks I couldn't afford to pay my salary, but it was charged against the business and, I might add, it has since been paid in full.

Then I took stock of my equipment. I found that I had something

This figure, let me explain here, was increased as the investment increased.

In my books I have kept strict account of all of these items just as though they were accounts with jobbers. The interest on the investment was charged and paid monthly,

This is how it worked out: When that private account reached \$700 I drew it out of the bank and carried it in to the cashier of my bank and told him to purchase a thousand-dollar bond for me. Then I placed the bond in his hands as security for the \$300 I had borrowed to help buy the bond. Now, while I was paying 5% on the \$300, my bond was paying me $2\frac{1}{2}\%$ every six months or 5% per year on the entire thousand, so while I alone could not purchase a thousand-dollar bond and while the \$700 was netting me but $2\frac{1}{2}$ to 3% in the bank, with the help of the bank I made that \$700 pay me a full 5% yearly.

I continued to salt down every penny I could save out of my salary—which by the way has been raised quite a number of times since those days—until I crossed that \$300 off the books. Then I started for another \$700 and repeated the same thing until now I have quite a number of bonds in my safe deposit box. Of course some of these have reached maturity and the principal has gone into other bonds. And the coupons clipped every six months go right into that sinking fund which is used to purchase more bonds. In the meantime the sinking fund is being swelled by the "salary" and "interest on the investment."

When I made improvements and additions to the old shop, the business itself had to pay for them. Or if it couldn't, which was seldom, I took a bond over to my cashier friend, got the money I wanted, left the bond as security and went right ahead with my improvements. I didn't need to ask any favors nor beg anything from anybody. I got the money because the bank was glad to loan on the security I presented. And while I had to pay the bank five per cent, don't lose sight of the fact that the bonds were also paying a little bunch of five coppers per year, for each dollar they represented.

I haven't said a word about the shop business itself; I haven't mentioned a thing about the profits of the business; for I was also figuring on making a legitimate profit on the work that left my shop. Certainly the salary didn't cover that and neither did the interest on the investment. So the profits of the business were another account—and that



Apologies to Farm Imp. News

ARE YOU ALLOWING THE AUTO EXPERT (?) TO SEPARATE YOU FROM PROFITS THAT BELONG TO YOU?

over a thousand dollars tied right up tight in stock and equipment. That thousand was adding three cents per cartwheel to itself every year it stayed in the bank. If by taking it out I could not get at least five cents per, I would consider myself better off if the money stayed in the bank. So I figured that I must get at least fifty dollars out of that business every year as my interest on my investment.

the salary paid weekly, and so on.

That salary item was treated just as though I was working on a salary for someone else. It was used to pay my household and personal expenses. What was left of it was banked with those fifty yearly dollars' interest on the investment. That account was a personal one—it wasn't used in the business, it wasn't drawn upon except for one purpose, and that one purpose was the Floating of the Sinking Fund.



account wasn't called "Profit and Loss."

You know that is a matter that I could never get through my head—this charging of profit and loss to one account. It has always seemed to me that I would want to know just what my profits and losses were, and not simply bunch them all in one account; and you may be sure that I kept strict account of the profits and the losses.

So the profits of the business must carry the business along. Under no circumstances is any part of the sinking fund applied to the needs of the business. That sinking fund is just a little side line that the owner of my shop owns all alone; and while I'm not riding to work in a limousine I will be able to take things easy when I'm too old to longer pull in the harness.

That first seven hundred was the hardest to grab. The money dribbled and dripped at first very slowly—then a small drop or two, and several times the little stream threatened to stop entirely. But I kept at it, and after the first little pile the second came easier. And then the third was still easier, until year after year I have grown so enthusiastic that I have several times been accused of miserly tendencies, by the Mrs.

Don't get the idea that this has all come about easily. Don't think that I haven't at times almost failed. Don't think that the job of floating that sinking fund has been all honey and roses, so to speak. The first few years were years of hard, stubborn toil every step of the way. But when you see the money piling up to float the sinking fund and you see your business grow and thrive by reason of your pushing it still harder to produce still more to keep that sinking fund floating, your heart

pretty nearly breaks one of your ribs in its pounding and ecstasy.



Benton Asks Why So Much of Business System?

"Hello there, Benton! Haven't seen you for a long time," exclaimed the Editor, as the recipe-man burst into the sanctum. "I was just wondering about you and your recipes and if you had both deserted us."

"Not quite deserted you," returned Benton, removing his coat and lighting one of the Editor's cigars. "But I've been away for a while and when you tell me just why you are putting all that stuff about business and bookkeeping in 'Our Journal' I'll tell you what I've been doing," and Benton settled himself into his favorite chair, placed his feet on the edge of a neighboring table and blew several smoke rings that evolved into halos about his head, but which (meaning the halos and not the head) as quickly vanished into masses of blue vapor.

"That's what's bothering you, eh?" laughed the Editor. "Well, that matter is quickly explained, Benton, and then you can rid yourself of some of those good recipes I know you have in that new book," and the Editor turned in his chair, tilted back and began:

"In the first place, ask yourself what one thing the smith and every other man is working for. It's money. No matter how much a man has, no matter how little he gets, he is working for money or its equivalent—profit. And profit is the excuse every single business has for its existence. The smith is in business for profit.

"Now, ask any smith what keeps him from getting rich and wealthy, and he will say: 'Lack of sufficient profit.'

"That's it—lack of sufficient profit. That is what keeps the man from building a successful business; and so he says to

his neighbor: 'Look here, brother, you are apparently in the same boat. You are just scraping and skimming along on a mere suggestion of profit—so am I. You are afraid to raise prices, because if you do all your customers will flock to my shop and you will then be worse off than ever. I hesitate to raise my prices for the same reason. Why not form a union, agree on a price schedule, and then we will both raise prices and thus get more profit?'

"So they speak to other smiths and finally form a union or association; and they make out a price list and they raise prices—BUT for how long?

"I'll tell you, Benton," and the Editor pounded his desk in his conviction, "the association and organization idea has been tried thoroughly for the purpose of controlling and maintaining prices—but it has failed and will continue to fail until the right means are used.

"I am not finding fault with the association, the union or the organization of any kind. What I say is wrong is the way the organization usually goes about the control of prices.

"We are assisting in the formation of blacksmiths' associations every day; we believe in organization. But the matter of prices cannot be controlled by agreeing on a price list and then secretly cutting the prices.

"That is why we are devoting pages to bookkeeping and price-and-profit talk and demonstrations. That is why we are getting up-to-date smithshop owners to tell how they figure profits, how they keep their business records, how they do business and keep accounts.

"For we believe that when a man knows his costs, when he knows his expenses, he will not sell his services, his work, his goods for less than cost. And I am glad to say that our belief is proving correct. Just now the blacksmith needs to know how to charge for his work as well as how to do it. He needs to know how to keep his business records as well as how to keep his fire. What would it profit a smith had he the experience of centuries if he knew nothing about his costs? Lack of knowledge of the business end of smithing will discount all the experience a man could gather in a thousand lifetimes."

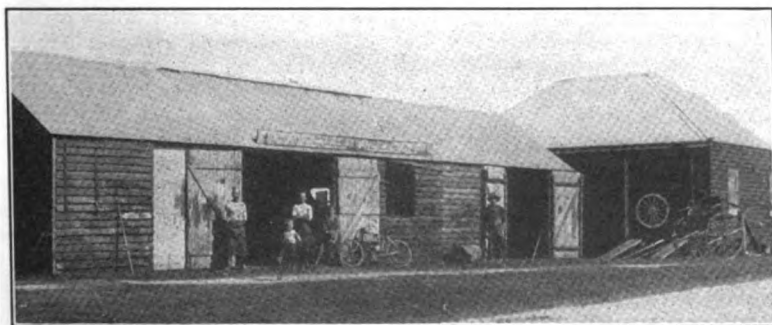
"I hadn't looked into it quite so deep," said Benton, as the Editor finished his talk. "You have convinced me that you are right, and from your talk I am surprised that you don't devote every page in the paper to good business talk. The average blacksmith needs it, and I think now it will be the means of elevating the craft and making it what it should be. I am sure—"

Jim Franklin came in at this point and interrupted further talk on the subject with a request for a recipe for iron cement.

"There are several leaks in the steam lines over at the plant, and I was just wondering if Benton couldn't give me a recipe for plugging the leaks. We shut down over Sunday, and while the pressure won't be entirely removed in the steam lines it will probably not be heavy enough to interfere with my cementing the leaks if you can give me a good cement recipe."

"I think I have just what you want," said Benton, taking out a brand-new recipe book and turning to the index. "Here we are now: Mix enough raw linseed oil with sufficient oxide of manganese to make a thick paste. Apply this to the leak, covering it thoroughly. Keep the pipe warm, so as to absorb the oil, and in twenty-four hours the cement will be as hard as iron."

"That is just what I want," returned Franklin, and with a "thank you" to Benton and a nod to the Editor he went back to his work.



A QUEENSLAND, AUSTRALIA, GENERAL SHOP—THAT OF MR. ESAU BLOOMER



The Man Who Doesn't Know When He's Licked

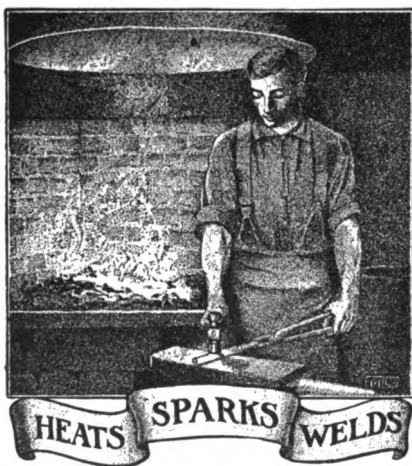
W. O. B.

"He doesn't know when he's licked" is a pretty good thing to say about a man—in our estimation.—*Heats, Sparks, Welds—November, 1912.*

There are men on God's earth
Who have shown their real worth—
In life's battles they've won their just pay;
They have fought the good fight,
Have won by their right—
"Surely they are great men" you will say.
Yes, yes, they are great—no one will say nay
But one man whom fame has not picked
Is the chap of whom you derisively say,
"He doesn't know when he is licked."

There are men who will fight,
Who will battle with might
When the conflict is going their way.
They will give, they will take,
With never a quake—
"Surely they are not cowards," you say.
What then of the man—the one of real stuff,
Who fights against odds and is tricked?
Who never cries "quit", and calls every bluff,
Who doesn't know when he is licked?

There are some who will say
As you labor today—
"You have lost—you cannot win out."
But you show them a grin,
As you sail in to win—
Then straightway forget all your doubt.
For the man who's worth while—the man
you can't beat—
The man though by fame yet unpicked,
Is he who will strive in the face of defeat,
Who never knows when he is licked.



Horse-sense, sand and ginger are three of a kind and hard to beat.

Small capital rightly used may outweigh big capital on the scale of profit.

Visiting the fortune teller won't sidetrack the future that's coming to you.

Cuff Brasher says: "Y' can't never tell by the noise how far a gun carries."

Is careful, painstaking work a steady diet with you or a periodical banquet?

And after the spring-cleaning, treat the inside walls of the shop to a coat of white-wash.

Any one can sell goods on the buyer's own terms, but it takes a salesman to sell under difficulties.

When you adjust a mistake, do it right—do it so the customer will think of you as a pretty square man after all.

When you think it a pretty rough old world, just remember that you can't smooth a stick with the soft side of the sandpaper.

If you've got an interfering animal, just try curing him by fattening. The fuller he gets in the quarter the less likely is he to hit himself.

Pay careful attention to each old customer's wants, and then pay as careful attention to the wants of the new ones, and success will stare you in the face.

Fatten your profits by shortening up on expenses and losses. And when costs advance, pad the selling price accordingly. You're in business for profit, not pleasure.

If you promise a job for a certain day, get it done that day. And when a customer promises to pay on a certain day, remind him of the fact that you keep your promises, and then—get your pay.

It won't take a minute to write up an interesting item about that big job you did last week. Others will find as much of interest in your hints, kinks and methods as you find in theirs. Better let the Editor hear from you today.

Try the telephone as a bill-collector and a business-solicitor—make your telephone investment pay dividends. Don't simply pay your telephone bill and consider it a necessary expense—consider the phone an opportunity, and make the most of it.

How are the first months of 1913 treating you? How do they compare with last year? Will you need to push for prosperity harder to equal 1912, or are you ahead now? Get into the harness with both shoulders, and then get your heart into it, too.

Spring-cleaning? Done yours? Good time to clean up that collection of old tires, wheels and what-not that is littering up the outside of the shop. Get at it now. Save out what is really worth anything, but do throw out the trash and truck.

A man cannot do his best in pinching shoes and a string for suspenders, and a horse is almost human. Pinching shoes and a harness held together with string discount all the animal's good intentions and his willingness. Give the horse a chance.

Capital is the lifeblood of business, and the blood is the capital of the body. The heart, proprietor of the body, turns over the blood capital once in every forty seconds—2,160 times each 24-hour day. How often are you turning over the lifeblood of your business?

There are still some smiths who seem to think that the patent medicine and tobacco signs add to the good appearance of their shops. A few neat signs of your own will help your business and put more real money into your pocket than all the signs the shop can carry.

It has long been a favorite story in many quarters that the ancients had some method

of hardening bronze tools the secret of which has been lost. However, modern bronze under careful hammering can be made as hard as the ancient, so that, after all, there is not much to the old "Lost Art" story.

Ever look at welding as just about the most exacting operation in any man's work? There are no half measures in welding—either 'tis or 'taint a good job. No amount of argument, no amount of demonstration, no amount of testing will make it anything but what it really is. And when a welding job is poor, it is no good.

You cannot run your business on the money in your debtors' pockets. And your efforts and work will not do you or your family any good unless you get the money that belongs to you. Clean up the old accounts—go after them tactfully, persistently and thoroughly. If necessary, sue for your money, and then start with a clean slate and keep it as clean as you can.

"What's the use o' them there ten questions?" asked Friend Tom, looking over the copy of Our Journal which we had just handed him. "Trying to make schoolboys out o' old veterans? Seems t' me like some more o' this here modern foolishness." But when Tom was asked if he could answer the first question, he hemmed and hawed, and finally remembered (?) a business engagement.

Will you take \$50.00 as a present? You can get that \$50.00 just as easily as the next person. Just write a good, clever letter—one that is original, and send it in with a renewal remittance. The fifty dollars are certainly worth working for, and the gold watch is guaranteed—7-jewel movement in a 10-year case. The fountain pen is no small item; it is also guaranteed by one of the largest makers of high-grade pens. Get your funny bone to working and send in a good, original letter.

Do you know or guess about your cost of doing business? Lots of business men, and some are smiths, "estimate" their costs. That kind of an estimate is as good as a guess, and a guess is usually as good as a miss. The only true way of getting at costs is to install a cost system that will find all expenses and enable you to know your expenses. Any expense is costing you something, whether you know it or not, and it is certainly best to know what you are paying for when it is costing you something.

Is your dollar full weight? Yes, Uncle Sam has stamped it "One Dollar," but is it full weight when it works for you? If you are working that dollar equally hard at both the buying and the selling ends you are getting full weight; if you are working it hard only at one end you are not getting full weight. You sell your work to get dollars; you sell the dollars to get supplies. If you sell one hundred and ten cents' worth of work to get one dollar, and then sell that dollar for ninety cents' worth of supplies, how long can you stay in business? It is not so much the dollar that determines your success in business, but what you GET and GIVE for the dollar—the GET and GIVE really determine the worth of the dollar—its weight. Are your dollars full weight?



Our Honor Roll

The Class of 1923

is small now, but it's growing and there is plenty of room for growth. It is easy to get into the 1923 class. If your account expires this month of April just send us a ten-year remittance and your name will appear right up near the head of Our Honor Roll—your subscription will be paid up to April, 1923. Why not make the saving? You cannot possibly lose, for our Long-Time Rates operate like life insurance if you die. We refund your money for the period for which you did not receive the paper. Isn't that fair and square?

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Two years.....	\$1.60	\$2.00	10 shillings
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You can also gain a place on Our Honor Roll by getting new subscribers. Show this big list to your brother craftsmen. A paper must be pretty good to get a practical man's subscription years and years in advance. Send in the new subscriptions and we will give you six months' credit on your account for each new order. Will you tell your neighbor?

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W. D. VALENTINE, Iowa	Aug., 1922	B. A. STEINKE, Ohio	Nov., 1917
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J. ERMAN, Ark.	July, 1922	W. T. CUTKOMP, Iowa	Oct., 1917
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J. W. HAAR, La.	Mar., 1922	R. ROSS, N. S. Wales	Sept., 1917
E. W. DILLON, Nev.	Mar., 1922	I. E. SPROUD, Me.	Sept., 1917
D. W. SMITH, R. I.	Mar., 1922	C. L. HOCKETT, Cal.	Aug., 1917
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R. H. KEITH, Ia.	Jan., 1922	M. DELJAGER, S. Africa	Aug., 1917
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T. P. CONSIDINE, Mass.	Dec., 1920	F. H. GIERKE, S. Aus.	July, 1917
Ed. GRIMM, Tex.	Mar., 1920	G. C. STONE, S. Africa	July, 1917
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H. L. HASWELL, N. C.	May, 1918	E. THIBAUDEAU, Wis.	Apr., 1917
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A. E. UHRLING, Wis.	Mar., 1918	J. M. BROWN, Tex.	Apr., 1917
P. J. THORNTON, N.W.T.	Mar., 1918	W. H. MILLER, Mo.	Mar., 1917
J. C. YOUNG, Pa.	Mar., 1918	J. C. WOODS, W. Aus.	Mar., 1917
D. C. HOUCK, Ohio	Mar., 1918	C. BOULTON, N. S. Wales	Mar., 1917
J. W. STEADMAN, Ohio	Feb., 1918	C. A. HAWKINS, Ore.	Mar., 1917
J. P. HOLZAPFEL, Penn.	Feb., 1918	A. L. MONTGOMERY, W. Va.	Mar., 1917
E. N. GATES, Vic.	Feb., 1918	J. PETERSON, Ia.	Mar., 1917
RENTON WAGON WKS., Wash.	Feb., 1918	J. ANDERSON, Tas.	Mar., 1917
WHITING Fdy. EQUIP. Co. Ill.	Feb., 1918	A. J. NEILL, Vt.	Mar., 1917
J. P. KOENIGS, S. Dak.	Feb., 1918	Ed. DETRICH, Ind.	Mar., 1917
RICHARD BRENNER, Tex.	Feb., 1918	LEWIS CHASE, N. Y.	Mar., 1917
W. F. HILL, N. C.	Feb., 1918	E. O. LEE, S. Dak.	Mar., 1917
W. MISCALE, Queen, Aus.	Jan., 1918	S. STEMPLER, Ohio	Mar., 1917
S. PORTERANCE, Que.	Jan., 1918	R. S. GUGIBERG, Kan.	Mar., 1917
D. C. FOLEY, Cal.	Jan., 1918	J. S. HARKELL, Col.	Mar., 1917
GLEASON BROS., La.	Jan., 1918	W. L. ROARK, Tex.	Mar., 1917
C. E. KRUG, Wis.	Jan., 1918	A. R. BARLOW, Tex.	Mar., 1917
		C. A. WHITACRE, Ohio	Mar., 1917
		B. P. CARNEY, Ill.	Mar., 1917

NAME	Subscription Paid to	NAME	Subscription Paid to
T. J. DORSE, Conn.	Feb., 1917	A. C. LODWIG, Cal.	July, 1916
F. MARSH, Mich.	Feb., 1917	J. K. HANSEN, Aus.	July, 1916
J. H. WHITE, N. H.	Feb., 1917	J. B. BARKER, Ill.	July, 1916
McGOWAN BROS., N. Y.	Feb., 1917	H. M. LARSEN, Wis.	July, 1916
W. H. SCHENE, Neb.	Feb., 1917	Geo. P. MacINTYRE, Me.	July, 1916
A. J. H. WEGNER, S. Africa	Feb., 1917	JAS. A. BUCHNER, Mich.	July, 1916
H. SCHNETTE, Ill.	Feb., 1917	H. M. FINGER, N. Y.	July, 1916
E. DOUGHERMAN, Ohio	Feb., 1917	L. H. STRANGE, Vict.	July, 1916
J. W. HAUGHT, Ill.	Feb., 1917	P. O'DONNELL, Vict.	July, 1916
CHAS. F. GIERKE, N. Mex.	Feb., 1917	R. J. HANCOCK, N. Z.	July, 1916
M. E. GOLLER, Pa.	Feb., 1917	F. G. WILSON, Calif.	July, 1916
J. POTTSOFF, Neb.	Feb., 1917	I. H. HALL, Ind.	June, 1916
G. M. GARRETT, Mich.	Feb., 1917	F. FULTON, N. S.	June, 1916
ERNEST FINLEY, Pa.	Feb., 1917	J. CHALMERS, S. Africa	June, 1916
A. TILLMAN, Cal.	Feb., 1917	G. R. HARRISON, Aus.	June, 1916
WALKER BROS., N. Z.	Feb., 1917	J. WATCICH, S. Africa	June, 1916
G. W. WHITTINGTON, W. Va.	Feb., 1917	W. VOIGHT, S. Africa	June, 1916
J. H. HOYLE, S. Africa	Feb., 1917	MARTIN JENSEN, Wis.	June, 1916
IRVING BROS., N. Y.	Feb., 1917	CHESTER HUMBERT, Wis.	June, 1916
F. ROSCHY, Pa.	Feb., 1917	LINCOLN UNDERHILL, Cal.	June, 1916
AUGUST MILLET, Ill.	Feb., 1917	M. BROTON, N. Dak.	June, 1916
C. P. ROBERTSON, S. Africa	Feb., 1917	HANS ERIKSEN, Ill.	June, 1916
O. DANNEMAN, Minn.	Jan., 1917	C. MORRELL, N. Brunswick	June, 1916
S. HETEM, S. Africa	Jan., 1917	J. O. CONRAD, Kan.	June, 1916
G. A. GURLEY, Ore.	Jan., 1917	ADAM SCHMITT, Mich.	June, 1916
F. K. WADDE, Me.	Jan., 1917	J. G. REEVES, S. Aus.	May, 1916
L. V. SENNY, Neb.	Jan., 1917	I. H. LUNDER, N. Dakota	May, 1916
S. H. AUSTIN, N. Y.	Jan., 1917	JAMES SINCLAIR, W. Aus.	May, 1916
H. KAHN, Ia.	Jan., 1917	H. BAKER, Aus.	May, 1916
J. H. BERGEN, Kan.	Jan., 1917	E. Q. KREHBIEL, Kan.	May, 1916
F. G. A. WILLIAMS, S. Aus.	Jan., 1917	C. H. CAIRNS, N. Y.	May, 1916
J. B. SCHEIDLER, Ind.	Dec., 1916	P. V. JOHNSON, Ohio	May, 1916
F. KUMMER, Ohio	Dec., 1916	F. E. SMITH, Vt.	May, 1916
ALFRED CASE, N. Z.	Dec., 1916	C. A. STEBBINS, Kan.	May, 1916
H. GRIMM, Utah	Dec., 1916	SANFORD BAKER, Mo.	May, 1916
A. H. GOODING, S. Aus.	Dec., 1916	E. B. ANDERBERG, Ill.	May, 1916
LEONARD SMITH, N. J.	Dec., 1916	R. H. KUERTS, Iowa	Apr., 1916
C. F. SHAW, Man.	Dec., 1916	WELSH BROS., Ind.	Apr., 1916
W. EDWARD, Pa.	Dec., 1916	KELLHERR BROS., W. Aus.	Apr., 1916
W. W. EGLY, Pa.	Dec., 1916	P. A. PETERSON, Ia.	Apr., 1916
JOS. BOYLER, Mich.	Dec., 1916	G. F. BOWERS, Okla.	Apr., 1916
J. WILLIAMS, N. S. Wales	Dec., 1916	D. E. McDONALD, Fla.	Apr., 1916
J. H. W. SCHNEIDER, Cal.	Dec., 1916	JAMES BAXTER, S. Africa	Apr., 1916
W. SAUER, Minn.	Dec., 1916	E. P. DIGNAN, S. Aus.	Apr., 1916
F. F. DARLING, Cal.	Dec., 1916	W. H. WINGET, Vt.	Apr., 1916
CHAS. NEWLAND, Cal.	Dec., 1916	H. F. DISINGER, N. Y.	Mar., 1916
J. T. BRAM, Ia.	Dec., 1916	W. H. CRUMLY, Ind.	Mar., 1916
P. H. ST. LOUIS, Wis.	Dec., 1916	M. C. THORP, Tenn.	Mar., 1916
C. E. NICKOLA, Okla.	Dec., 1916	D. BLYTHE, Iowa	Mar., 1916
C. J. HALL, Wash.	Dec., 1916	S. D. METZLER, Kans.	Mar., 1916
BOB FRICK, Ala.	Dec., 1916	SHORT BROS., Iowa	Mar., 1916
JOSIAS BROS., Tex.	Dec., 1916	CHAS. WHITE, Penn.	Mar., 1916
R. CLEMENS, Conn.	Dec., 1916	W. LINCK, N. Y.	Mar., 1916
SCHREFFEL & SCHMITT, Pa.	Dec., 1916	J. J. HRACKOVEC, S. D.	Mar., 1916
A. BRUCE, Ohio	Dec., 1916	A. E. HOUCK, N. Y.	Mar., 1916
J. E. BRATTY, Mo.	Dec., 1916	E. A. PROUTY, Mass.	Mar., 1916
Geo. CASSIDY, Scotland	Dec., 1916	GUST LENS, Mich.	Mar., 1916
JOHN KAIN, Ky.	Dec., 1916	J. CLIFFORD, Minn.	Mar., 1916
F. W. HOWELL, Ill.	Dec., 1916	E. GRICE, Mich.	Mar., 1916
H. A. CREVEYER, N. H.	Dec., 1916	Geo. TEMPEL, N. Y.	Mar., 1916
W. M. CRIFTHS, Aus.	Nov., 1916	G. W. BRYANT, Vt.	Mar., 1916
W. B. TAYLOR & SON, Mo.	Nov., 1916	T. GAMESTER, N. H.	Mar., 1916
G. WHITTEN, Mass.	Nov., 1916	P. F. HONESHOGAN, N. Y.	Mar., 1916
J. M. WINGENDA, Wis.	Nov., 1916	T. J. HARVEY, Ill.	Mar., 1916
TOM NOLAN, S. Aus.	Nov., 1916	W. E. HART, Okla.	Mar., 1916
H. J. FRENCH, N. Z.	Nov., 1916	C. SCHMIDT, Neb.	Mar., 1916
F. N. BROWNING & SON, Ky.	Nov., 1916	J. SHARPLES, N. J.	Mar., 1916
J. MACUAB, Scotland	Nov., 1916	A. ROCKENCHUP & SON, Ia.	Mar., 1916
P. GRESSEN, Ill.	Nov., 1916	C. H. ALEXANDER, N. Y.	Mar., 1916
J. W. GRIBBLE, S. Aus.	Nov., 1916	A. M. HOWARD, Wis.	Mar., 1916
W. G. SIM, N. Z.	Nov., 1916	G. N. FOLLMER, Kan.	Mar., 1916
H. V. RUEHL, Ia.	Nov., 1916	G. N. FOLLMER, Neb.	Mar., 1916
G. LINDBORG, Ind.	Nov., 1916	W. WILLOUGHBY, Mich.	Mar., 1916
FRYMAN STELL, N. C.	Nov., 1916	H. HOFFMEYER, N. J.	Mar., 1916
J. S. FINKENBERGER, Ind.	Nov., 1916	FRANK L. LOCKE, N. Y.	Mar., 1916
R. D. WILKOM, N. Y.	Nov., 1916	FRANK L. EVARTS, Conn.	Mar., 1916
C. W. SCHMIDT, Cal.	Oct., 1916	C. R. WINGET, Vt.	Mar., 1916
T. J. MAGUIRE, N. Y.	Oct., 1916	H. & J. CHISHOLM, N. Z.	Mar., 1916
A. W. WAITE, Cal.	Oct., 1916	C. F. MOKKENTEN, Aus.	Mar., 1916
C. W. ELLIS, Tex.	Oct., 1916	H. D. PHILLIPS, S. Aus.	Mar., 1916
J. P. SIMON, N. S. Wales	Oct., 1916	J. B. FRY, Wash.	Mar., 1916
E. A. KNAPP, N. Z.	Oct., 1916	L. A. DOWNING, Cal.	Mar., 1916
T. J. HASKINS, N. S. W.	Oct., 1916	S. W. ELLIS, N. Y.	Feb., 1916
LOTELAN & SKINNER, N.S.W.	Oct., 1916	M. DUVOISIN, Ill.	Feb., 1916
W. B. KNOUFF, Ala.	Oct., 1916	E. LAMPFMAN, N. Y.	Feb., 1916
GORHAM BROS., Ia.	Oct., 1916	T. KROGER, Conn.	Feb., 1916
W. H. F. BRAUER, N. C.	Oct., 1916	W. H. NORTON, D. C.	Feb., 1916
CLARK OLDS & Co., Neb.	Oct., 1916	H. VALIERE, Quebec	Feb., 1916
IRWIN SCOTT, N. Y.	Oct., 1916	E. D. SATTERLEE, N. Y.	Feb., 1916
C. E. DURHAM, Kan.	Oct., 1916	A. C. DUNSTON, Mich.	Feb., 1916
M. RINGO, S. Africa	Oct., 1916	J. WHITTET, Kan.	Feb., 1916
W. DELLEY, Queens, Aus.	Oct., 1916	TRAVESSE BAY, Mich.	Feb., 1916
G. H. TORLINE, Kans.	Sept., 1916	O. GUNDERSON, Minn.	Feb., 1916
S. B. PHILLIPS, W. Va.	Sept., 1916	W. E. PEACOCK, N. J.	Feb., 1916
G. E. HARPER, Texas	Sept., 1916	E. B. BUSICK, Ill.	Feb., 1916
J. J. ILLER, N. S. Wales	Sept., 1916	F. MEHLIN, La.	Feb., 1916
JAMES PORTGREN & Co., Mo.	Sept., 1916	J. W. HEFFLEWHITE, Ohio	Feb., 1916
JNO. GOETTINGER, Ia.	Sept., 1916	A. A. SCHREIBER, Tex.	Feb., 1916
Geo. FLECKENSTEIN, Cal.	Sept., 1916	J. T. DILLARD, Tex.	Feb., 1916
Geo. HILL, Aus.	Sept., 1916	F. J. FLESSEL, N. Y.	Feb., 1916
E. C. BEARD, Aus.	Sept., 1916	E. P. JONES, Kan.	Feb., 1916
J. K. GLINICKI, Mich.	Sept., 1916	E. J. BISHOP, N. Y.	Feb., 1916
OSCAR BUNNER, Md.	Sept., 1916	J. N. TYLER, Ohio	Feb., 1916
A. J. HAMMOND, Cal.	Sept., 1916	T. BROWN, Conn.	Jan., 1916
ROBERT MURRAY, Cal.	Sept., 1916	W. SMITH, Penn.	Jan., 1916
D. E. WRIGHT, Pa.	Sept., 1916	J. S. RUSH, Ohio	Jan., 1916
J. S. HARKELL, Col.	Sept., 1916	E. W. MARTIN, Cal.	Jan., 1916
R. SOMMER, Aus.	Sept., 1916	N. T. HOWARD Mo.	Jan., 1916
J. A. SEQUIN, Can.	Aug., 1916	H. L. WOLF, Pa.	Jan., 1916
JAMES CLARKE, Jr., Aus.	Aug., 1916	H. KREITZER, Pa.	Jan., 1916
DISPATCH Fdy. LTD., N. Z.	Aug., 1916	A. MOSHER & SON, N. Y.	Jan., 1916
A. A. BARLKE, N. D.	July, 1916	F. FARLOW, Mass.	Jan., 1916
ERNEST E. DOTTY, Ohio	July, 1916	C. M. HANUM, Conn.	Jan., 1916
F. C. ARSTON, Pa.	July, 1916	PETER COX, W. Aus.	Jan., 1916
HENRY FISHER, Tas.	July, 1916	CHAS. H. KERN, Ill.	Jan., 1916
J. W. FOWLER, N. Z.	July, 1916	J. H. ECKROYD, Cal.	Jan., 1916



Ten Questions for the Month

The subject of anatomy is an important one to the practical shoer, and no man should be allowed to work on a horse's foot who is not familiar with the anatomy of that foot. The questions asked this month will not make a good shoer of a poor blacksmith, but they will show good and poor shoer alike what they do not know about shoeing and anatomy—and that is all these questions are expected to do.

1. What is the average thickness of the wall of the horse's foot at the toe and at the quarters?

2. Into what principal parts is the hoof of the horse divided?

3. When a horse stands in the regular position, i. e., with toes pointing in a straight line and forward, how is the animal most likely to swing his feet when traveling?

4. If the animal stands base-wide, i. e., toes pointing outward, how will he swing his feet? If the standing position is base-narrow?

5. Mention some points about the growth of the hoof; the rapidity of its growth; the growth of the shod and unshod hoof, etc.

6. Name three or more reasons why heel and toe calks are detrimental to the health of the foot and limb.

7. How many bones in the horse's leg from knee to sole?

8. Name these bones?

9. How may the edges of a hoof crack be held or fastened to prevent the growing of cracked new horn?

10. What is the advantage of painting and applying salves and ointments to the wall of the foot?

Answers to Questions in March Issue

1. The mechanic should first of all know that systematic procedure in the overhauling of a car is the only way in which he can hope to do the work correctly. Then he should have a place for everything as he takes it from the car. Not only is it important to begin systematically and to do the work orderly and methodically, but it is also important to place the removed parts of the car so that assembling may be quickly and easily accomplished.

2. A number of wooden boxes properly labeled into which all the

parts of the various sections of the car may be placed are very handy. For regular work along this line metal pans will be found most economical. Another device is one large box divided into bins of suitable size and labeled. This box if fitted with castors will be found especially handy.

3. These small parts may be marked with a punch. Valve parts for example should be punched with one, two, three and four or more marks as necessary before being removed. Gears should be punch-marked at the meshing points, other parts punch-marked in some distinguishing way.

4. It is best to begin at the front end of the car and work carefully to the rear. Before removing any part from the car, be certain that it is disconnected. For example, when about to lift out the motor be sure beyond possible doubt that every pipe, every wire and every bolt and nut is disconnected before starting to lift.

5. The cover of the transmission case should be removed and all dirt and old grease cleaned out. The gears should be carefully examined, and if badly worn or chipped or broken the gears should be replaced with new ones.

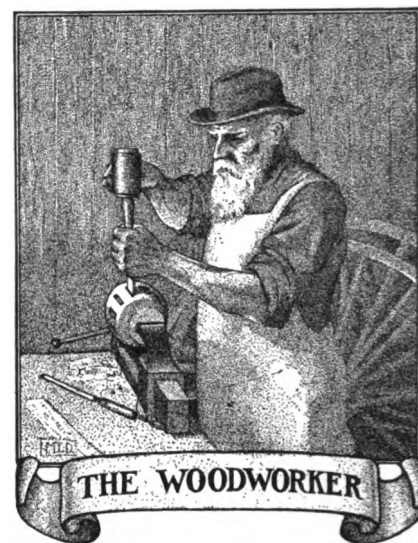
6. The pins of Universal joints should be replaced with new ones.

7. The stroke of a piston is the distance it travels in the cylinder.

8. First drain all the oil from the tank containing the lubricating fluid and flush with gasoline. Then take the oil pump apart and clean thoroughly with gasoline. The oil pipes carrying the lubricant to various bearings are then thoroughly flushed by forcing gasoline through them.

9. The wires should be carefully examined, and broken or worn wires replaced, the timer and magneto carefully cleaned and lubricated, the batteries tested, and if weak replaced with new ones.

10. First the car should be assembled as soon as possible after cleaning and thorough inspection so as to guard against loss of parts. It is also important that all parts be thoroughly clean and free from grit, dirt and stray strings of waste. Bolts and nuts should be screwed up tightly and cotter pins inserted as soon as the nut is tight. All joints requiring packing should be packed with new material and they should, of course, be perfectly clean.



A Device for Laying Out a Wagon Axle and How to Use It

A. C. GOUGH, M. E.

There are probably an unlimited number of rules for laying out wagon axles. No doubt, some of them have proved satisfactory for all the years. In some cases the methods have become a matter of personal pride with some workers, and woe be unto the one who would question their accuracy. Upon one occasion, when the writer was a very small boy, he was startled by the mutual attitude of two of the old men in the shop. They were just about to come to blows, which incident was accompanied by the usual flow of language preferred by those who indulge in that particular pastime. It developed that each wished to have his own method for laying out a wagon axle considered as correct and infallible.

It is not the purpose of this article to question the value of any of these rules, but rather to offer a mechanical device suggested and tried by experience.

It is patent to all that a special axle lathe furnishes the best method for shaping the axle to fit the wagon skein, but there are a large number of shops wherein the amount of work would hardly justify the installation of a special machine. In a shop of this class it has proved satisfactory to lay the axle off upon the side, removing the surplus material with the band saw; next laying the axle off upon the bottom, the surplus material upon the sides



being removed in the same way. This leaves the axle squared to proper dimensions, which furnishes a splendid guide for taking off the corners, this being done with the drawing knife, using the wood rasp for the final fitting to the skein. After forming the axle complete the points were given a coat of red lead and the skeins pressed on—the skeins first being warmed to a temperature of about 400° Fahrenheit.

So far as is known, there have been no actual tests made sufficient to determine the exact ratio of the distance between the planes of the wheels at front and the rear—the distance being measured upon a horizontal plane. If an absolute rule for this purpose were determined, it would then be a very simple matter, by similar triangles, to determine the amount necessary to cut off the point upon the rear side of the axle. This amount could be either computed or solved graphically. The information at hand concerning this matter is founded on experience. The following is the method practiced in a general shop of Kentucky for many years:

For new wagons, the axles were laid off to make the front wheels stand 1 inch closer at front than at the rear; the rear axle being laid off to make the "hind" wheels stand $1\frac{1}{4}$ inch closer at front than at the rear. This was considered "gather" enough to cause the wheel box to run against the shoulder of the spindle, rather than against the nut; and any extra friction between the box and shoulder of the skein would hardly seem necessary.

The gauge shown in the accompanying engraving may be used to determine very accurately the amount necessary to cut off the point of the axle at the bottom in order to cause the wheel to "stand upon a plumb spoke", also the amount necessary to remove from the point of the axle at the rear side to cause the wheel to stand in any desired position relative to the other wheel or axle. The tool may be constructed as follows:

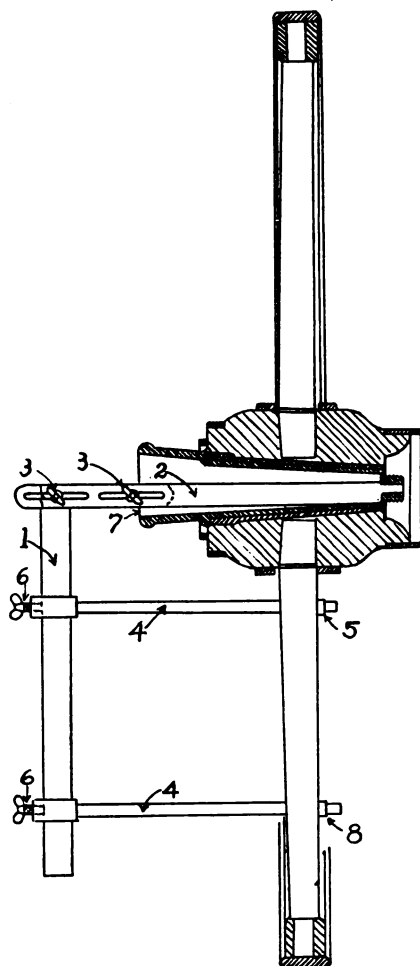
A soft steel square may be used for the part 1, about one half of the short side being cut off, two small square holes being put in the remaining part in which fit screws with thumb nuts 3, 3. The part 2

may be a piece of band or sheet steel, slotted and fitted carefully at an angle of 90° to the standard 1. One end of the parts 4, 4 is enlarged and slotted to snugly fit the standard 1, being secured in any desired position by thumb screws, 6, 6. The parts 5 and 8 are to be at right angles to 4, 4, upon which they may be adjusted and secured by thumb screws similar to 6, 6. When desired, the part 2 may carry an adjustable indicator to show the length of the skein inside. If there

placed in the position shown, when the part 2 may be secured by the thumb nuts 3, 3. The distance, 7, which is the amount necessary to cut off the point of the axle at the bottom to cause the wheel to "stand upon a plumb spoke," may be measured with a scale.

The axle being sized to rough dimensions with two working faces, one side and the bottom perpendicular to each other, then with a tri-square lines are laid off upon these working faces at a distance from the ends equal to the inside length of the skeins. Next the straight edge is placed upon the side working face at the bottom end of this line and at the distance, 7, from the bottom at the extreme point of the axle and the line drawn which determines this part of the work. The inside dimensions being taken with the calipers. They are laid off at their proper positions and the lines drawn which determine the form of the axle in this direction. After the surplus material has been removed with the band saw we can proceed to lay off the axle in the other direction.

For example, say it is desirable to have "1-inch draw," or "gather." This means that the plane of each wheel at the tire must be $\frac{1}{4}$ inch out of the plane perpendicular to the axle. Or $\frac{1}{8}$ inch out at a distance equal to one-half the radius of the wheel forms its center. Then to determine the amount necessary to remove from the rear face of the axle in order to have the wheels stand in this way we may proceed as follows: Leaving the gauge in the position as shown, revolve the skein forward through 90° until the front face of the skein comes into the position occupied by the bottom of the skein as shown in the engraving; then measure the distance corresponding to 7, call this distance A. Next adjust the lower arm, 4, until it occupies a distance one-half way between center of the wheel and the face of the tire, then move the part $8\frac{1}{8}$ inches toward the standard 1, and secure it there. The distance through which part 8 should be moved is $\frac{1}{8}$ of the "gather," which in this case equals $\frac{1}{8}$ inch. Now if the distance corresponding to 7 be again measured it will be found less than distance A, calling this latter measurement B; A minus B



A PRACTICAL DEVICE FOR LAYING OUT A WAGON AXLE

are sufficiently large numbers of steel skeins, or skeins with long sleeves, it may be necessary to make parts 2 and 4, 4, longer than indicated here.

Of course any mechanic may see at a glance how the gauge can be used, but to avoid any misunderstanding the following explanation is offered: the parts 5 and 8 are secured equidistant from the standard 1, the skein being in the position which it would normally occupy in the wheel box, the gauge is



equals the extra amount necessary to remove from the rear face at the point of the axle in order to have the wheels stand in position as assumed desirable.

So far as known, only one gauge of this kind has been used, which was constructed by the writer about 1902. This was used for several years and no cases were found to which the method outlined did not apply.

What a Sales Record Can Teach You

A. M. BURROUGHS

The banana man who sells his entire stock of bananas every night can tell you the exact number of bananas purchased and the exact number sold during any business day.

He knows all there is to know about the "sales end" of his business. It isn't *guess work* with him. He knows absolutely what he has done; what he has *sold*; what he has *purchased*; what *profit* he has made.

With him each day's business is a separate business, just as much so as if he were a banana merchant on Monday, a peanut vender on Tuesday, and a baseball player on Wednesday.

If he over-buys, he just cuts the price to make his stock move. He doesn't carry any dead stock. It isn't necessary to take an inventory at the end of the day to find out how much stock he has. He has *none*.

What he doesn't know about 'his *sales* and *purchases* isn't worth bothering about.

He has a "statement of his business" that makes him look like a wizard compared to most retailers.

He has *sales analysis* down to a fine point.

Yet the banana man doesn't need to keep books. He has only one line of goods; he is his own and only clerk; he closes out his business every day—it is comparatively simple to arrive at all the sales facts.

But even the smallest merchant has a much more complicated business.

The average merchant has many lines of goods. He has several helpers. He doesn't close out his business every day. It continues from day to day, week to week and month to month. He doesn't even close it out at the end of the year.

On account of its being *bigger*, he can't know as much about his business unless he uses *bigger methods* for getting the information.

If a man has a mind *big* enough and *magic* enough and *superhuman* enough to grasp all the details of a big retail business and to store them up in his memory for weeks and months—

Well, then, he would be *wise enough* to use records instead of brain cells for a bookkeeping system.

He would do just what all the successful retailers, the chain store fellows, and the really successful one-man businesses are doing.

There is a chain of big clothing stores, doing business in a number of cities, employing from twenty-five to a hundred clerks in each store, which can give you just as complete information about its sales as can the banana merchant who sells but one line of goods, has but one clerk and who closes out his business every day.

This chain store company is not unusual; its methods are unusual only in that they are typical of the methods of other *successful* merchants in every line of business.

For every sale that is made in each of the stores in this chain, the clerk makes out a sales slip giving the name and amount of the goods sold and the price.

The bookkeeper tabulates this information and is able to tell at the end of the day how much goods of each line has been sold, the number and the amount of the sales by each clerk, the number and the volume of sales in each department, and the number and the volume of sales in the entire store.

In the home office, the bookkeeper tabulates this information so that the managers of the great corporation which conducts the stores can tell at a glance exactly what profit has been produced by each line of goods, and by each clerk in each store.

If the expenses in each store, for instance, exceed by one-fourth of one per cent the established average on the total sales, that store is going to hear from the home office before long.

Each store is allowed about 10% to 10½% of its total sales as salaries. After the manager's salary in each store is taken out and allowance made for bookkeepers, stenographers, janitors, watchmen, etc., about 8½% to 9% is left to pay the clerks.

If a single clerk shows sales in such small amount as to raise the percentage represented by his salary to above 9%, he will very quickly hear from the manager.

If the condition continues for any considerable length of time, the clerk is certain to be dropped and some one else put in his place who can reduce the cost of sales behind his counter to 9% or less.

If a clerk sells enough goods to bring the percentage represented by



THE MICHIGAN SHOP OF MR. L. P. MILLER, WHERE GENERAL SMITHING IS DONE



his salary down to less than 8% of his sales, the management watches him and soon raises his salary or promotes him.

And then if a certain line of collars, for instance, doesn't sell as readily as some other line, the line which sells best (the store is in position to *know* what lines sell best) will soon be the only line of collars carried—the line which will be pushed.

With complete sales information these stores are able to quickly eliminate the goods which *won't* sell and to replace them with goods which *will* sell.

And no business which doesn't keep a complete record, and which doesn't *push* lines which show a fair profit and *drop* lines which don't, can long hope to compete with businesses which do.

Apply these methods to your business for a while and see if you don't increase your sales and decrease your ratio of expenses.

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Keeping Accounts in the Small Shop

H. N. POPE

The first possession should be books, three in number—one small one for a day book, one for a cash book and a larger one for the ledger. In the first place, all the doings of the day should appear in the books; all cash should be noted in the cash book and should tally with what appears in the day book. Do not think because you take in only a ten-cent piece, it is of no account to mark it down. When these small bits are left out, one often loses many a dollar. Be sure also to keep all accounts posted in the ledger, as it saves time in looking up a bill. One can tell at a glance how all customers stand. Some may think that a cash job does not need to go down on the books or, if it does, only as cash received. It is often worth something as a record of work done; for instance, Mr. Smith runs a shoeing and repairing shop; Mr. Black has a horse shod, pays for it and goes on his way. Black is a cash customer, but is also noted as a man who tries to get all he can for as little as he can. In about two months Black comes into the shop, appearing to be very much put out, and says, "Here, Smith, what did you put on my horse? Lead shoes? They've been on but



THE HOME AND GENERAL SHOP OF MR. JAMES JACKSON OF NEW YORK STATE

two weeks, and look at them—worn down to nothing." Mr. Smith looks them over and says, "They are pretty well worn. Two weeks, you say? Well, let's see." Goes to his day book, turns back to the date and proves it is fully two months. If he had just put the price of the job in his pocket, and made no note of it, it would have been his word against his customer's, and one would have been as good as the other. So, I say, keep the books, and keep them in shape, fully posted, and it will surely pay in the end.



The Care, Repair and Operation of the Automobile—4

(With Special Reference to Overland Cars)
Bearings

With the exception of lubrication the most important factor in the operation of an automobile is the condition of the bearings.

The three principal kinds of automobile bearings are: Plain bearings, ball bearings and roller bearings. The most important bearings, and those requiring particular attention, are the five main bearings, the four connecting-rod bearings and the four wrist-pin bearings.

Whenever an engine bearing has become worn until the inner surface is no longer absolutely round, this condition indicates itself by a peculiar knock. On examination it will be found that the bearing is loose, and that instead of being even all around, the contact is irregular. Main bearings and connecting-rod bearings are lined with babbitt; a metal which gives very little friction. Should the bearings overheat, on account of neglect in lubrication, the babbitt metal will melt out, leaving the motor shaft uninjured, while the bearing itself can be rebabbitted at small expense.

When a main bearing is worn until it produces an engine knock it must be "tightened up." This simply means that the two bearing halves (Fig. 1) are brought closer together, which is usually done by filing down the main bearing cap. It is clear, however, that this does not make the bearings exactly round, so that it will have to be "fitted." This is done by scraping.

Right here it should be remembered that it requires considerable time and trouble to obtain satisfactory results and that even under the most favorable conditions it is difficult to obtain perfect bearing surfaces, unless the job be undertaken by one familiar with such work.

A point should be made to remove an equal amount of material from

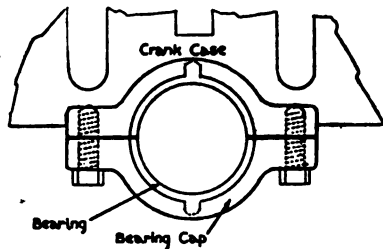


FIG. 1—WHEN A MAIN BEARING PRODUCES A KNOCK IT MUST BE TIGHTENED

either side of the bearing. The bearing should be opened and both shaft and bearing halves painted with a thin solution of Prussian blue dissolved in water. When the color has dried, the bearing should be clamped together and rotated three or four times. It will then be seen that the blue will scrape off on the high points of the bearing.

Opening the bearing again, these high spots should be delicately scraped down with a sharp-cornered tool made for that purpose, the painting done again, the bearing clamped together as before, and another test made. The novice will find this repeated test a laborious task, but it must be done over and over until the blue rubs off evenly all around. Even an expert mechanic can hardly scrape a bearing and make a creditable job in less than two or three hours of steady labor, from which it becomes clear that patience is of prime importance in an attempt at scraping bearings.

When a bearing is so closely fitted that the Prussian blue rubs off evenly it is termed "properly spotted in."

For a hurry-up job, and when the chief consideration is to get the work done without much loss of time, an insufficiently "spotted in" bearing will be tight and work well without pounding; but it should be made a point to have the bearing properly "fitted in," because otherwise its life would be shortened considerably and the necessity for another fitting arise very soon.

In case an emergency fit has been made, care should be taken not to have the bearing so tight as to overheat it. When bearings are fitted in the shop, however, the practice of running the motor on a belt is a most commendable precaution, because it will prevent the possibility of having the bearing overheated on the road.

Often when a bearing seems adjusted too tight, a few sharp raps with a hammer on the caps and on

the end of the bearing will loosen it up enough for a smooth working fit. To see whether it is the main bearings that are responsible for an engine knock, raise the crank-shaft by the flywheel, when any play between the crank-shaft and its bearing may be noted by the "feel."

Another convenient method is to place a jack under the flywheel, as shown in Fig. 2; the play, if any, may be felt on moving the jack handle up and down.

What has been said concerning the main engine bearings also holds good for the connecting-rod bearings, with the one exception that the two bearing halves may be brought closer together by the removal of some of the "liners" between them. For very fine fitting the "liners" may have to be filed down.

Play in the connecting-rod bearings may be located by moving the rod up and down by hand; the removal of the lower half of the crank-case is, of course, necessary before the connecting-rods can be reached.

The wrist-pin bearing is not bab-bitted. Its location exposes it to considerable heat and the fact that the wrist-pin does not revolve in the bearing but is clamped to the piston, with the connecting-rod oscillating upon it, makes it possible to use bronze as bearing material, while the wrist-pin is made of cold rolled steel (Fig. 6).

For renewal of the bearing, a bronze wrist-pin bushing and a wrist-pin only need be substituted.

As a rule, wrist-pin and connecting-rod bearings are apt to wear sooner than the main bearings, for which reason it is advisable to examine the former before disturbing the adjustment of the main bearings.

The Clutch

The clutch is composed of two members, one of them in the form of a truncated cone, and the other (the flywheel) is bored to a conical seat,

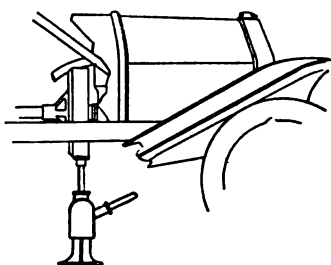


FIG. 2—ANOTHER METHOD IS TO PLACE A JACK UNDER THE FLYWHEEL

so that the two can pass into and out of frictional engagement over a large area of contact and with a minimum of movement.

The clutch is properly set and should not need attention during the entire first season, or within 15,000 or 20,000 miles of running. After that nothing but a relining of the clutch face with leather will be required.

New clutch leather should be soaked in water or neats-foot oil (not lubricating oil) and stretched tightly over the clutch face. In fastening the leather be careful that the copper rivets are properly clinched or turned over, and that they are driven home until their heads are well below the top surface of the leather. When this is not done, the clutch is likely to "grab," or engage, "fiercely." After the wet clutch leather has been fastened in place it should not be permitted to dry too

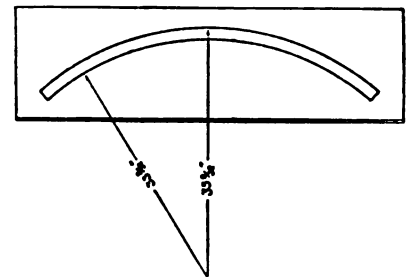


FIG. 3—HOW TO MAKE A PATTERN FOR THE CLUTCH LEATHER

quickly, because in that case it is apt to shrink and pull away from the rivets.

New clutch leather when ordered from the factory comes with the ends cemented together, and it is only necessary to slip it over the clutch, driving it to its proper position with a mallet or piece of wood.

Whenever possible, order clutch facings from the factory, but when the clutch must be relined in an emergency, and the old lining is not available to serve as a pattern, secure a piece of first-class, unstretchable belt-ling, 3-16 inch thick, 12 inches wide and 45 inches long.

To lay out the correct pattern of the facing, draw on a piece of heavy paper the arc of a circle having a radius of 35 9-32 inches, and below it the arc of a circle with a radius of 33 9-32 inches, as shown in Fig. 3. The exact length of the belt will be 44 3-16 inches, but it is well to make it somewhat longer, because it will be safer to be able to trim the ends



later on. Put the rough or flesh side of the new clutch leather on the outside.

The short, spring-pressed studs around the clutch and under the lining serve to raise the leather slightly in places for a more gradual and smooth engagement.

The removal and replacement of the rather powerful main clutch springs, of which there are three, is best accomplished by means of two levers and a piece of stout wire, as shown in Fig. 4.

When, after considerable running, the clutch begins to "grab," this is usually due to the drying out or hardening of the clutch leather. A dressing of the lining with neats-foot oil or castor oil to soften it will restore its easy and full engagement. The clutch may also "grab" because the rivets have become flush through the wearing down of the leather. Renewal of the rivets is a remedy in this case.

The clutch may be tightened by screwing the three adjusting nuts down on their studs. Care must be taken, however, to tighten one nut just as much as the others.

If the clutch is too tight it will "drag" and burn the leather; it should be just tight enough to hold under the maximum load and yet release fully and gradually.

The small spring-supported brake disk at the left of the clutch is designed to bring the rotation of the clutch to a quick stop upon disengagement.

When, on engaging the clutch, the car picks up speed only slowly, it is a sign that the clutch is "slipping"; this may be due to the foot-rest of the clutch pedal being too close to the toe-board of the car, and it may be remedied by moving the lever to the rear, in the slotted sector shown in Fig. 5. Other possible causes of slippage are:

Insufficient tension of the main clutch springs. Increase tension by

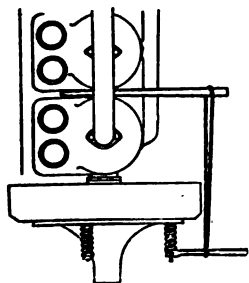


FIG. 4—A SIMPLE METHOD BY WHICH TO REMOVE CLUTCH SPRINGS

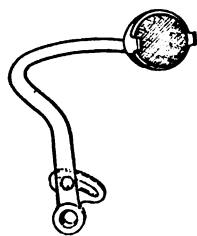


FIG. 5—THE FOOT-REST OF CLUTCH PEDAL IS ADJUSTED

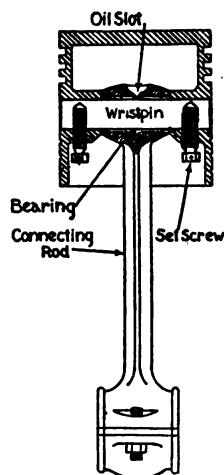


FIG. 6—CONNECTING-ROD BEARINGS

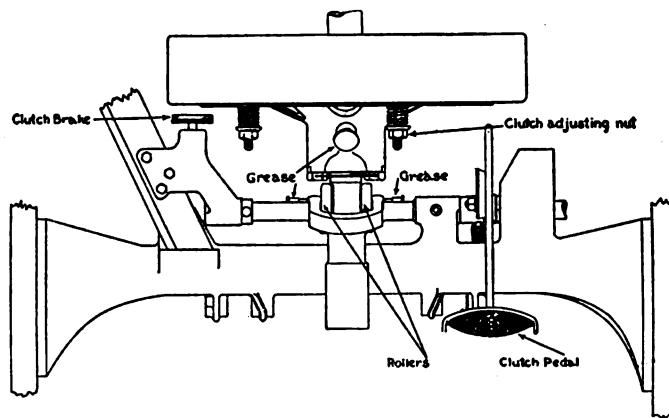


FIG. 7—SHOWING THE CLUTCH AND ITS OPERATING MECHANISM

screwing down the nuts, giving the same number of turns to each (Fig. 7.)

The clutch leather may be greasy. A little fuller's earth thrown on the clutch facing will absorb the grease or oil, or it may be removed with a kerosene-moistened rag.

The lining may be burned out or worn down because the clutch has been allowed to slip too much in starting or speed-changing. In this case the application of a little neats-foot oil or castor oil will set things right.

In no case permit lubricating oil to come in contact with the clutch surfaces. Do not attempt to make a slipping clutch hold by throwing sand into it, nor engage the clutch quickly, trying to make it hold. Sand will destroy the pitch of the flywheel, and sudden engagement is apt to result in breakage either of the drive-shaft or of the universal joint.

Keep the clutch rollers oiled and the universal joint full of grease.

The grease cup on clutch and rollers should be kept full of good, hard grease; turn it down once or twice a week.

There also is an oil hole leading to the ball thrust bearing not shown in the sketch, which may be reached with the oil can through the spokes of the clutch. Lubricate occasionally.

How to Hold an Endorser After You Have Him On the Note

Not long ago a merchant of my acquaintance was working to dispose of a block of special merchandise to a buyer whose credit was

poor. The merchant was anxious to sell and the buyer to buy, but the question of payment stood in the way. Finally the merchant, after working hard, induced a certain man of means to endorse the buyer's note for the full amount of the purchase. When that was done he turned the goods over and congratulated himself on having made a good deal. The note came due, the maker (the buyer) did not pay it, and the merchant lost his chance to collect from the endorser by neglecting to do what the law says must be done in such a case to make the endorser liable.

Therefore something in this article about how to hold an endorser on a promissory note after you have gotten him.

The fundamental law of negotiable paper provides that in order to make an endorser of a note liable, the note must be presented to the maker when due and payment asked for. This is subject, generally speaking to these three exceptions:—

First.—The endorser has no right to demand presentment of the note to the maker when presentment is impossible, as where he is absent.

Second.—The endorser has no right to demand presentment of the note to the maker when the maker made the note without consideration, merely for the endorser's accommodation, and when the endorser knows that the maker doesn't intend to pay it.

Third.—The endorser has no right to demand presentment of the note to the maker when he (the endorser) has waived presentment in some way.



More about all these a little further on.

If the note is not presented to the maker on the day it is due, and none of the above reasons, or any others, exist as to why it should not have been, the endorser will be freed from all liability.

And even if the note is presented, the endorser will still be released if another even more rigid requirement of the law is forgotten, viz., giving the endorser notice if the maker doesn't pay the note.

Under the laws of all States, including the uniform negotiable instruments' act, which many States have already passed, the endorser of a note must be told at once that the maker hasn't paid it or he will be released. When I say at once I mean within a reasonable time, but what is a reasonable time the circumstances of each case must determine. Naturally the circumstances differ. Where the endorser lives in the same town with the holder of the note, the notice should be given the same day. Where they live in different places, time will be allowed for the mails to carry.

The uniform negotiable instruments' law, above referred to, prescribes the time in which notice must be given the endorser in a variety of cases.

Where there are several endorsers on the note, the holder of it who has failed to get payment from the maker, should notify them all. Other-

wise, he will be able to hold responsible only those whom he notified.

There is no special form for notice to an endorser of the non-payment of a note. It can be verbal or written, but should always be written if possible. The substance of the notice is: "A, the maker of a certain note (describing it), has had same presented to him for payment but has failed to pay; take notice that the undersigned, holder thereof, will look to you for payment."

If no notice is given to the endorser, he goes free. The importance of the point is great, for on very many notes the endorser is the only party financially responsible.

Promissory notes are usually presented to the maker for payment by banks with which they are deposited for collection; and notices of protest are sent to the endorsers by notaries whom the bank selects. This is the more convenient method, and usually the surer, but it is not necessary. The holder of a note may himself present it to the maker, and if it is not paid, himself notify the endorsers.

A word now about the three exceptions under which an endorser cannot take advantage of the failure to present a note to the maker. The first two explain themselves. I will discuss the waiver by an endorser of presentment and notice. Often a man will endorse a note

and use the words "waiving demand and notice." In such a case an endorser is liable even if no presentment is made to the maker, or notice of non-payment given. Waiver can also be implied from the circumstances of the case.

(Copyright, by Elton J. Buckley)



The Heat Treatment of Steel

J. F. MCSWEENEY

In treating self-hardening steel we have found that to follow out the instructions of the manufacturer of the steel is to get the best results at all times. To anneal self-hardening steel we pack the pieces or parts with the bone that we have used for case-hardening. Heat until red and allow to cool off in box; then you can machine without any trouble.

On treating beading tools we cool the tool off in oil. We do not bring the tool to a sweating heat; a cherry red is the heat at which we quench in oil. A great deal depends on the operator where you have no pyrometer in getting the right temper.

On treating carbon steel, such as shear blades and all tools made of this steel, where the blades are long—36 inches and more, it is quite difficult to keep the blade straight in treating and tempering. Blades 2 by 8 by 36 inches are heated to 1200 and 1400 degrees Fah., then put into a tank of flowing water for 30 seconds, then put into a tank of oil and left to cool off. This treatment has proved to be all right with this size blade.

In treating softer steel I have taken two pieces from the same bar, 1½-inch round case-hardened, then cooled



PRESIDENT WILSON AND EX-PRESIDENT TAFT IN THE INAUGURAL PARADE

It will interest our readers to know that the horses drawing the Presidential Carriage were shod with Cat-Foot shoes



the one off as soon as it came from the furnace, and allowed the other piece to cool off in the box. I then heated this the second time and cooled off and took them to the laboratory and had them tested for elongation and tensile strength. The one that was taken from the box and quenched stood a test of 128,300 pounds, with 1-32 elongation in 1 inch. The other piece that was reheated stood 105,100 pounds and 1-32 elongation in 1 inch. In this case it would show that it would be better to quench as soon as taken from the box when case-hardening.

In making a test of spring plates and tempering in fish oil:

No. 1 spring plates were heated to 1850 degrees Fah., set and tempered without re-heating the plates a second time. This spring stood free $5\frac{1}{2}$ inches high and its loaded height was 4 13-16 inches, with a weight of 41,000 pounds.

No 4 spring plates were heated to 1770 degrees Fah., set and tempered without re-heating the plates a second time. This spring failed; free height 7 7-8 inches, loaded 6 inches, with 17,000 pounds, the plates being soft. We made several other tests in the same way with different heats; none were as good as the first one, which was set and tempered at 1850 degrees Fah.

In treating iron we do not do anything different than what has been done by all blacksmiths. Not to get the iron at any time too hot in making iron from scrap; to get it the proper heat to weld, and not work the flume too cold, for when you do this you open up the fibers of the iron and it will not be close fibered if it is hammered well while hot. We have been using as much as half scrap iron in the manufacture of our material.

How Flues Are Welded and Repaired in Quantity

JOSEPH P. KANE
B. & O. R. R.

This is how we handle flue work in the shops at Newark, Ohio:

In cleaning our flues we have a rattler, 28 ft. long, running at 15 revolutions per minute. A load of 200 flues will clean in two hours with water and small pieces of iron to loosen the scale. The flues are then

dumped at the cutting-off machine, where the first cut is made at an angle of 45°; this work being performed with a bevel cutter. The flues are then placed at an oil furnace which is one of our own design. The flues are expanded hot and the safe end placed inside and brought to a good welding heat, welded and shouldered at the same heat. Both operations are performed by one man on the machine with the shoulder attachment, and 400 flues can be done

400 lbs. per square inch, hydrostatic pressure, and all defects found. The number of flues removed from the boiler after the pressure has been put on is about one fifth of one per cent.

The following are descriptions of our flue machines: First cut is with two bottom rollers with top cutter attached to direct driven shaft, which runs at about 1,200 revolutions per minute.

The furnace is of crude oil burning type, with three holes, and is capable

A PRIZE CONTEST

From time to time we receive very clever letters from our friends and subscribers—letters full of original thought—some humorous, some grave, all good, pleasant reading. To encourage clean, clever, original letters of this kind we offer prizes as follows:

FIRST PRIZE - - \$50.00 IN GOLD

SECOND PRIZE - A GOLD WATCH

THIRD PRIZE - - A FOUNTAIN PEN

for the cleverest letter accompanying a subscription remittance of one dollar or more and received during 1913.

The letters may be humorous or grave; they may contain kicks or bouquets; they may be written in rhyme or prose—but they must be clean, clever and original, and accompanying a subscription remittance of one dollar or more.

As an example of the kind of letters we want, the following received from Mr. Tom Roop of Ohio is an exceedingly clever one:

Dear Editor Bernhardt:—

Please find enclosed an unfolded sample sheet of Uncle Sam's paper of recent issue upon which you will observe certain figures and pictures, solid valuable reading matter and no fiction. No claim is herein made that this enclosure in weight or intrinsic value equals your yearly enclosure to me, but it is customary for an orthodox subscriber when he has a \$ about his person for which he can find no present or future use to shy it at the Editor's plethoric purse through the mail or by some other artful agency, and against his vicious practice the hapless Editor seems to have no adequate means of self-defense.

Your sympathetic friend,
Tom Roop

P. S. I will surprise myself and take out two years' Christmas.

Get your "funny bone," your "bump of cleverness" and your "dome of originality" to working—make a grab for those fifty round little pieces of Uncle Samuel's favorite product. Get busy now, whether your subscription expires now or later—but get busy, then you'll have your letter ready. Remember—cleverness and originality are the deciding points. The judges will be announced later. The contest closes, December 31, 1913.

in a day of ten hours on this machine. After welding, the flues are taken to a cutting-to-length machine, which cuts each flue for its own hole in the boiler. They are then expanded for the front end of the boiler next. This work is done on a machine especially constructed to perform the work very fast, after which the flue is placed in the tester and tested at

of heating a flue to a good welding heat in 48 seconds when everything is working right.

The flue welding machine is designed after continuous motion bolt header, with shoulder attachment, which makes a very neat and serviceable job.

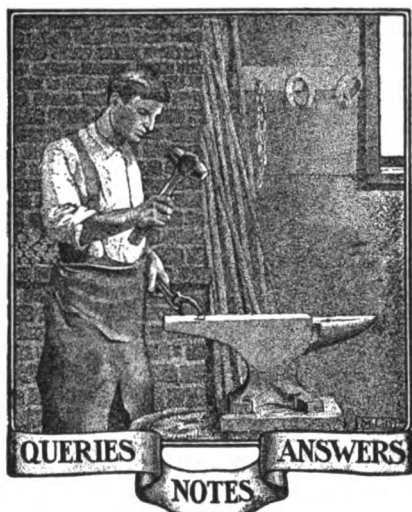
The machine for cutting to length is next. It is our custom to take our



own length of boiler and we measure for all flues and cut each flue for its own hole. This machine is similar to first-cut machine, but cuts the flue off square.

Then comes the expanding machine with two shafts, one operating on the inside and the other on the outside of the flue.

Next is our tester, which is in a horizontal position, and the flue is placed in the tester machine and filled with water, and when the hydrostatic pressure is applied it is an easy matter to detect any defects.



To Solder Granite.—Put a copper plug in the hole of the kettle or article to be soldered, and polish the granite and plug until bright; then solder just as you would tin. C. R. KEMMERER, Pennsylvania.

A Query for the Horse Trainer.—I would like to know through the columns of your paper if a horse ten years old can be made to trot when he never did anything but pace. I say no. Am I correct? J. E. SCHNELL, Alabama.

Welding Steel to Cast Iron.—I want to make inquiry as to how and what method is used in applying a steel plate to cast iron; something similar to putting a steel face on a cast anvil. Will some brother reader give me the information by letter, as I would like to have it immediately. L. A. HOLCOMBE, Arkansas.

Wants to Know About Oil-Burning Engines.—I would like some information in regard to crude oil-burning engines. Would they be as profitable to install as a gasoline engine? I would like to hear from someone who has or is using one. Would like to see something on this subject in an early issue. R. J. McLAREN, Arizona.

A Question on Axe Tempering.—I would like to get a formula for tempering axes. PHILIP J. CHOCK, Minnesota.

In Reply.—The article by Mr. Dayton O. Shaw, on page 148 of the March issue, is an excellent one on re-dressing axes. It will undoubtedly give you just the information you want.

Wants a Veneer Machine.—Will you please publish in THE AMERICAN BLACKSMITH complete specifications for building a veneer cutter? The machine I need makes a straight cut, carries the knife in a sash

and is to cut steamed bolts 26 inches long to 3-16 inch in thickness.

R. E. SCHOONOVER, Wisconsin.

Shoeing for Club Foot.—Can some reader give me a remedy for "club feet"? I have a mule that stands entirely on the toes of her front feet. Not a particle of the front feet touches the ground except the point of the hoof. Can anything be done to make the mule stand on her feet properly? She is eight years old and her feet have always been in this condition. I shall appreciate any advice on the subject. R. ELMA HARRIS, Tennessee.

Varnishing Without Coloring.—We have been taking your paper for several years, and I have read your "Queries and Answers" column, but have never noticed anything telling how to draw out the color on old work without repainting it. Revarnishing it again doesn't bring out the luster as it should. Is there a chemical of any kind that would draw out the color? We have an auto to touch up and the paint is perfectly good but we don't like to recolor it. Have you a receipt for that kind of work? GEO. E. KIESLING, Missouri.

Those Chisel Cracks.—In reply to Mr. H. W. Pope of Wisconsin. If his chisels develop circular cracks it shows that the interior of his steel is hot when the shell tries to cool quickly. Probably the water is too cold. Try getting your steel up to a cherry. To temper, let your temper run out to a pale blue, dip quickly and let it run out to a straw, if it will run that far; if not, just hold it on the fire a second until you catch it, and it will stand. Put a little saltpeter in the water. C. R. KEMMERER, Pennsylvania.

How to Measure Stock for Bands.—Here is a kink which dispenses with a lot of guess-work for making bands for hubs or anything else. I have several strips of leather of various thicknesses and for a band $\frac{1}{4}$ inch thick I take a leather strip $\frac{1}{4}$ inch thick and wrap it around the article to be banded. I then lay it out on the stock, allow for the weld, and I get a perfect fit every time. You must be sure, however, to use leather the same thickness as the band. If you want a flare to the band, bend the stock edgewise before bending in the circle. I took the tug out of a harness to get the length of a $\frac{1}{4}$ -inch band, and it was O. K. R. H. GLEASON, South Dak.

A Handy Tool Rack.—As I have been a subscriber to your paper several years, of course I am always glad to see it coming, for it has my kind of "dope" exactly, and what I want and enjoy.

I have a handy and cheap tool rack which I made myself: Take an old buggy wheel; 2 inches from the inside of the rim place another rim and fill in around the hub with light plank or sheet iron and you have a place for your anvil tools. Hang your tongs around on rim of wheel, then take a piece of piping and fasten old buggy spindle in it and fasten this to the floor, making same about 4 feet high. Put wheel on this spindle and you have a revolving rack. J. E. SCHNELL, Alabama.

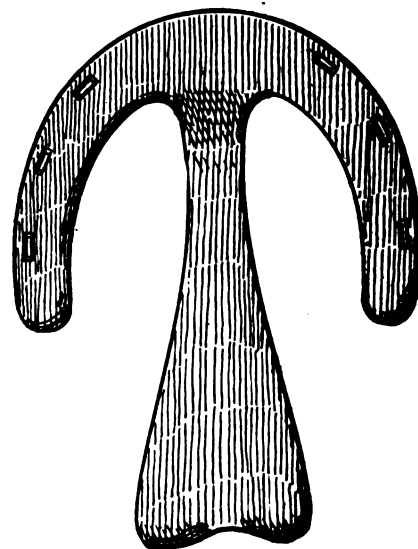
Cement Floors and Blocks.—I am building a new shop and would like to know what would be the best floor—wood or cement. Would cement be hard on the feet? The shop is going to be 40 by 20. Can you give me any advice on how to arrange the inside so that it would be real handy. Would a cement block make a good anvil base or not? I have an engine and an emery stand, drill and band saw. I would like to have the opinions of some of my brother readers. WM. M. PEOT, Wisconsin.

In Reply.—The February issue, page 130, contains several items and opinions on concrete for floors and as a building material. Other information is given on page 25 of October, 1912; page 99 of October, 1908, and page 275 of August, 1911. An anvil block is described and pictured on page 100 of the February issue of 1908.

THE EDITOR.

On Corns and Their Cure.—The article by E. W. P. in the January issue on the treatment of corns, what they are, their cause and their cure, is excellent, and is written in such a manner that it is quite apparent E. W. P. understands the subject he is talking about; but it is quite contrary to my ideas and to some of the articles written on shoeing in your valuable paper. I don't wish to find the slightest fault with this article on corns, but just for friendly discussion and in order to get the best results from it I think there are one or two little things that need debating. E. W. P. gives six causes which produce corns. He may have added the seventh by saying that one of the chief causes is the undue pressure which is brought to bear on the most tender part of the foot by the pinchers in wrenching off the shoe. This could be reduced by exercising more care in taking off the old shoes by having the pinchers towards the toe instead of towards the frog.

As to the cure: My experience has been that instead of cutting the foot away and putting on a bar shoe it is best to cut off $1\frac{1}{2}$ inches from the inside of the shoe, $\frac{3}{4}$ shoe or $\frac{3}{4}$ bar if only one heel is affected. In all cases keep the heels of the shoe thin, in an endeavor to get the frog to get a bearing on the ground as it would do naturally. Of course, the bar helps in this way. Where both heels are affected I would recommend a $\frac{3}{4}$ shoe with frog pad, or a



WHEN BOTH HEELS ARE AFFECTED
USE THIS SHOE

T-shoe as illustrated. As to contraction, I think a thinly built shoe with frog pressure would be more natural and more workable than the application of an expansion spring.

These few remarks are not made with the object of finding fault, but simply for educational discussion which may be of service to all. THOMAS NORTHWOOD, England.

Emery Grinders and Disc Sharpeners.—I see by the last paper that Jas. J. Challen of Alabama asks for information on emery grinders and disc sharpeners. I would advise Mr. Challen to get a Kerrihard emery stand and a Little Wonder disc sharpener.



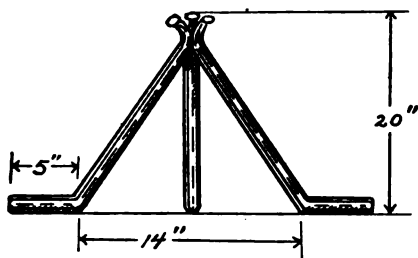
If he has disc plows to sharpen he should get the Giant Wonder, but if not, the Little Wonder will do all right.

The Kerrihard grinder is made purposely to grind plows, and one can use good-sized wheels on it, such as 2 by 16. Would advise a 2 by 16 "M" grade for cast plow lays, and 2 by 16 "P" grade for edge tools, etc. Of course these wheels cost quite a sum, but large wheels are cheapest in the end because they don't require such high speed.

The Wonder disc sharpener is the simplest to operate, and one doesn't need to take discs off the shaft to do the sharpening as with the rolling machines or when sharpening discs on emery wheels.

N. R. SPOPE, Missouri.

A Foot Rest.—Do you American smiths use a stand for supporting the foot while clinching? In all the illustrations of shops we have not noticed one in use. We enclose a sketch of one generally used in this country. We think it is the greatest labor-saver ever introduced in our shop, and the horse stands much quieter. The stand is made of



A FOOT REST RECOMMENDED BY AN ENGLISH SMITH

$\frac{5}{8}$ -inch square iron and is 20 inches high and shaped as shown. The illustration shows how it is made. O. J. S., England.

Wants Advice from Readers.—I have been thinking for some time about putting in a small dynamo and storage battery for lighting the shop, and also my home which is 300 feet distant. I would like to know if any of the readers of "Our Journal" have ever put in anything of this kind. I have a 3-horsepower gasoline engine; a 36-foot, 1 $\frac{1}{2}$ -inch line shaft; and run a feed mill; a disk sharpener; a grindstone; an emery wheel; a drill; a band saw; and a washing machine at the house, by means of two wires with a jack and pitman rig belted out from the line shaft.

I would like to run a washer and blower by electricity if it can be done with my engine. I would like to get the opinions of the readers of this paper on the practicality of such an outfit.

The disc sharpener, band saw and washing machine jack are of my own make. The sharpener takes the whole section of discs at once, thus avoiding the necessity of changing. F. R. TOMLINSON, Kansas.

The Cause of Cracked Chisels.—In reply to Brother H. W. Pope of Wisconsin, regarding cracks in his chisels, years ago I had the same trouble, and I think that possibly the trouble is in hammering, but more likely in tempering. Now the way I get a satisfactory job on chisels is to always hammer at a good red heat. Never strike either in drawing down to proper thickness or shaping in any way when black hot. When it is the right shape, heat to a cherry red from 2 $\frac{1}{2}$ to 3 inches, then dip in water or any tempering solution usually about an inch, holding it there quite a while or until you think there is about enough heat to draw the temper down to where it belongs. A good test is to let it run down to the point

where you can cut with a file; then set the edge in water one half inch deep. Now I think the cause of his trouble was that he did not heat his chisels up far enough, and when cooling them he probably pushed them into water just far enough to cause cracks by reason of the quick cooling of one part and the slow cooling of other parts.

R. H. GLEASON, South Dakota.

The Autoist and the Farmer.—Several years ago I noticed the question in "Our Journal," "Are you getting your share of automobile work?" About four years ago I added to my shop a cement building 32 by 50 feet for auto work, and employed one or two smiths to do the farm work, etc., and I devoted my time to the repairing of automobiles. Having fair success with the work I equipped my shop with the necessary tools. After working for one and one half years I sold all the auto tools and went back to the anvil—never more to return to the auto. I found that the farmer and the auto tourist are envious of each other when they both come to the smithshop. The tourist thinks his job should be taken care of first because he is away from home and should be accommodated so he can proceed on his journey. And when you charge him fifty cents per hour he thinks he is being robbed. The farmer, on the other hand, considers himself more important because he is a regular customer—and I believe he is—he tills the soil and feeds the world and is entitled to first place in the smithshop.

I will give a list of my tools: I have a six-horsepower I. H. C. engine; a scow disc roller; a screw cutting lathe; a boss hammer; a power drill; one double emery stand and one power blower. I would quit the shop if I could not have power tools.

GEORGE H. TORLINE, Kansas.

A Shoe for Crippled Feet.—I have been reading about the several kinds of horse-shoes for crippled feet, and I will describe herewith one which I have found to be very successful. I have cured quite a number whose feet had been cut on wire, causing them to walk on their heels. My method is as follows: First get a shoe to fit the foot and then weld another shoe on to the heels of the first one and allow it to extend about four inches behind. Then weld a strap of steel about 1 inch wide and $\frac{1}{4}$ inch thick to the heel end of this shoe, and allow this strap to extend up the back of the leg about ten inches—see the engraving.

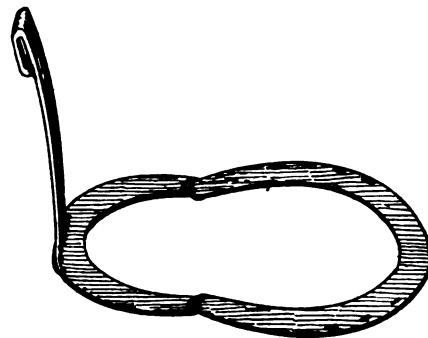
W. E. WHITFIELD, Texas.

Brazing and Drilling.—Could you tell me the best and most successful way to

braze cast iron, and where to get the proper materials with which to work?

Also, what is the best method of drilling holes in circular saws that are harder than the drill? J. H. SWEET, Nova Scotia.

In Reply.—Articles on brazing may be found in the following issues of THE AMERICAN BLACKSMITH: December, 1911, page



A SHOE FOR CRIPPLED FEET

60; December, 1909, pages 68 and 75; August, 1910, page 285; April, 1909, page 155; September, 1909, page 280. The September issue of 1908 contains a very complete article on brazing of all kinds, on pages 272, 273 and 274.

THE EDITOR

In Reply.—If Mr. Sweet will try the brimstone softening stunt I think he will be able to drill anything with a good drill. Heat the saw to a good red at just where you desire to drill your hole. Then at just exactly the point where the hole is to be, place a piece of brimstone and, when melted, drill in the ordinary way.

A. R. BROUSE, Ohio.

Old Saws and Vehicle Tracks.—How can old hand saws be polished bright as new? Also, what is the width of wide track vehicles from outside to outside of tire?

AUGUST OEHL, Texas.

In Reply.—Most any of the numerous polishing powders and pastes on the market will do to simply polish a saw. However, if the saw blade is badly rusted, make a paste of fine emery and lard or tallow and rub the blade with it until the rust is removed. An occasional application of common kerosene oil during the polishing with the emery will assist in removing the rust. After saw is clean and bright a high finish may be had by using crocus or rouge with a power-driven buffing wheel.

The standard width of track is generally understood as 4 feet 8 $\frac{1}{2}$ inches. In Texas



THE GENERAL SHOP OF MR. GEORGE H. TORLINE IN KANSAS



all trolley and street car tracks, with a few exceptions, are the above measurement. Wagon tracks are usually 5 feet center to center, or 5 feet 2 inches out to out. A wide track vehicle may be any measurement to suit the width of box, which should determine the track. A. E. W., N. Y.

Welding Trouble.—I am having trouble making welds. I think my trouble may be partly, if not altogether, due to sulphur in the coal. Of this I am not sure. When I make a weld the steel scales vary profusely and refuses to unite. After taking several heats I usually get it welded, but have been unable lately to get welds to unite at the first heat. There is a white deposit left on the anvil around the iron being welded. Will poor or sulphurous coal give such results? Any help that you can give me through the columns of THE AMERICAN BLACKSMITH will be appreciated.

SANDFORD E. FRAZELL, Nebraska.

In Reply.—From your reader's description of his trouble I should judge that he used what is known as an oxidizing fire, i. e., he blows too much air into his fire for its

brushers I would go and serve two years with J. W. F. of New Zealand and two more with Brother Hugh Christholm of the same place.

I am very much interested in the talks on fast shoeing. There is a man here in Philadelphia who has made ten dozen shoes in Philadelphia before dinner, taken a train for New York and made ten dozen more.

A READER, Pennsylvania.

A York State General Shop.—Our shop is 20 by 70 feet. We have a 3½-horsepower Deyo engine; a slitting saw; a cut-off saw; a turning lathe; a Samson hot tire shrinker; a Eureka hub borer and box setter; a Pratt & Whitney upright drill; a Champion blower; a power emery stand; a set of carborundum wheels; a hub boring and mortising machine; a spoke tenoning machine; a Buffalo punch and shear; a small jointer; a jig saw and all the other small tools that are necessary for the blacksmith and wood shop. We have a fine location; are in the upper Susquehanna Valley, three and one half miles below the head of the river. We

suppose he is using a shop which would rent for \$25.00 a month, and suppose he himself could draw \$25.00 per week working for someone else;—too many smiths lose sight of those facts.

Nearly all of the standard prices were made and established years ago when wages were low, and material (especially wood stock) was low and the cost of living was also low. Some of those old prices were raised a little, but not proportionate to what costs have raised. Take some item, such as new lister lays and plow shares, which brought the smith from \$4.00 to \$5.00 each; now these are either done for much less or their places supplied with ready-fitted ones from the factory.

There are a great number of jobs where factories and machinery cannot displace the smith, and on these jobs the smiths should raise prices. Every other trade has advanced prices and wages within the last fifteen years; and while the smith must pay higher prices for everything he has to buy he has not raised his prices materially for an age.

During my eleven years of business on my own hook I have often talked the matter of prices with my competitors and neighboring smiths and urged them to organize and fix prices which would put us on a level with the prices we had to pay, but I was always met with little or no encouragement. Every smith seemed to be afraid if he raised his prices he would lose all his custom.

Well, to make a long story short, I decided that some of the jobs would be better lost than done at the old rates, so I raised my prices on such jobs as I saw fit and asked no one to join me in the raise; and I have lost little trade to speak of, and those few customers who did leave me were glad to come back and pay the raised price because of the better quality of my work.

When I quit to take a homestead last fall, and to take a rest from blacksmithing, I had a shop 24 by 90, with cement floor, two engines, power fires, a punch and shear, a trip hammer, a power drill, a disc roller, an emery stand, a power saw, a planing machine, a cold tire setter, a Barcus stocks, a calking machine, a lathe and a full set of hand tools. I also have my own electric light equipment. I tried to sell out but could find no smith with money enough to buy my place, so I rented it. I also own my house and three lots and had enough money to get a fair start on my homestead.

While I was making my little pile, my competitor who was afraid to raise prices because he would lose his trade was there too, but he is still in a rented shop and still pays house rent. His shop equipment consists of a blower, anvil, two hammers and three pair of tongs. He has no credit and his note is not worth the paper it is written on.

Another trouble with the business is the fact that a blacksmith may work years and put all his earnings into equipment, and should he get disabled his equipment is almost unsalable, except at a great loss; whilst, if the same amount were invested in land or property which does not depreciate but often increases in value, he would fare better.

Under existing conditions, is it to be wondered at that nearly every smith who can sell out will do so at his first opportunity and try something else?

There are many retired smiths among the married homesteaders, and each smith knows of a few more smiths who would like to quit and go to the farm or elsewhere. None, however, are far enough ahead to make the shift, and their shops are more unsalable than a second-hand automobile.

J. W. POKORNY, South Dakota.



THE GENERAL SHOP OF E. TEACHOUT & SON OF NEW YORK STATE

depth. This over-abundance of air causes the steel to scale and naturally prevents cementation or welding. The remedy would naturally be to use a deeper fire and a little more care taken in using the blast. If his coal contains sulphur it will make the metal heated in it brittle or what is generally known as "red short," and naturally this brittleness will make the metal difficult to weld.

A. R. J., New York.

A Ten-Thousand-Dollar Shop.—I have been reading THE AMERICAN BLACKSMITH for the past year, and I think it is the best book in that line that I have ever read.

I work in a private place; having about thirty horses to shoe—eighteen drivers and twelve working horses. This is one of the finest shops in the State; the building alone costing about \$10,000; and it is equipped in first-class shape.

I read, in the August number, of a blacksmith in New Zealand who never served an apprenticeship at the trade, but secured his knowledge from his father. There ought to be a law to stop men who have not served an apprenticeship from entering the trade; and if I were the gentleman in question, before I would shoe those

have all the work we can do the year 'round, and are centrally located. The nearest shop north is three and one half miles; south, five miles; east, five miles; west, six miles.

E. TEACHOUT & SON, New York.

What Ails Business?—I might have been able to answer many of the questions asked through your paper, but always being busy and crowded on all sides I never wrote. But you ask one question that is more vital than any one asked heretofore, and that is "What ails business?"

Now, the shortest answer I can give you is this: 95% of the smiths are good blacksmiths but poor business men, and are paying too much attention to doing lots of work and too little attention to costs of doing business and the cost of living. And last, but not least, are not charging their business up with shop rent, if they own it themselves; not paying themselves the salary they would be able to draw if they were working for someone else.

If a blacksmith finds that he has \$100.00 left after paying his monthly bills for hardware, etc., and his living, he thinks he has made one hundred dollars' profit. But



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Subscribers should notify us promptly of non-receipt of paper or change of address. In the latter case it is necessary that you give us both the old and the new address.

From a Veteran

When a man has become a veteran of the craft—when he has worked at the trade for over 66 years—when he has been a foreman for over half a century and has been in the service of one employer for 48 years, his opinion on any matter connected with the craft should have considerable weight. His statements concerning a paper devoted to the trade must be conclusive and his words must be interesting to the craft generally.

Mr. Henry Hinkens of the St. Paul & Pacific Railroad is one of the best known railroad master blacksmiths in the country. He is honorary member of the International Association and has been a regular reader of THE AMERICAN BLACKSMITH for years.

He should be able to judge the value of a smithing paper. He should be able to tell whether or not a paper is of value to its readers.

Read what Mr. Hinkens says about THE AMERICAN BLACKSMITH:

You will find enclosed remittance to pay my subscription to your journal. I have been reading the paper with great satisfaction. I have worked at the trade for over 66 years, have been foreman for over 50 years and have served about 48 years on the same road—the St. Paul & Pacific—and still find that I can learn from reading THE AMERICAN BLACKSMITH.

Yours truly
HENRY HINKENS

Do you know of a smith who is too old, too wise (?) or too experienced (?) to learn from the pages of "Our Journal"? Show him this letter from Mr. Hinkens—the original is on file at our offices. Ask the smith who is too wise (?) to learn anything new about his trade if he knows more than a man who has seen 66 years beside the anvil. Ask him if he knows more than a man who has solved railroad smithshop problems for over 50 years.

Subscription Agents

When a stranger solicits your subscription to THE AMERICAN BLACKSMITH, or any other publication, insist upon his showing you absolute proof that he is an agent in good standing and is employed by the publication which he represents. Don't, under any circumstances, give the man your money if you are not sure that he really works for the paper he says he does. No matter what the man offers you—no matter what price he makes—no matter what premium he promises to send—DON'T GIVE HIM YOUR MONEY IF YOU ARE NOT SURE.

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Truthful Advertising

We have mentioned in previous talks, the tendency of modern business toward truthfulness in its advertising and in its general business transactions. And now comes New York State with a bill compelling truthful advertising and making it a misdemeanor to make untrue statements concerning anything offered for sale. And violations are punishable by fines of from one thousand to five thousand dollars.

And the reliable business houses, manufacturers and advertising organizations are in favor and are backing bills of this kind. The faker, the business pirate, the business robber, are being brushed aside. They cannot live unless they change their methods. It is becoming more difficult every day for the unscrupulous business man to pursue his methods.

Since the printing of its first number, THE AMERICAN BLACKSMITH has rigidly excluded the faker, the swindler and the unscrupulous, from its columns. "Our Journal" has always made a firm stand for the fair and square deal, and in its own dealings has often done more than the fair and square thing.

Look through the columns of THE AMERICAN BLACKSMITH—you'll find the advertisements of reliable business concerns, but you'll not find any fakers of any kind. An advertiser to purchase space in our columns must be reliable.

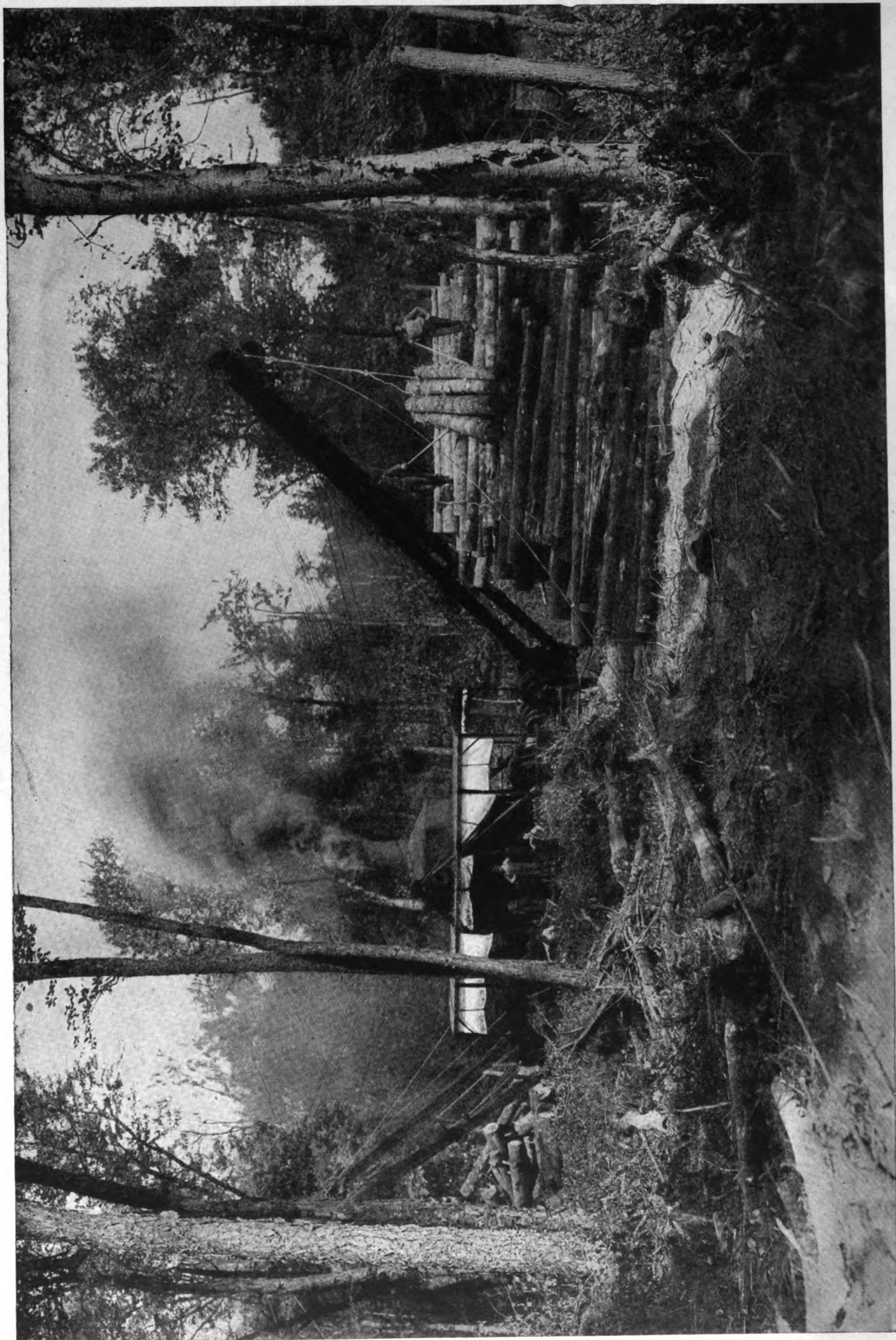
You Can Help

Do you know that if you and every other reader of "Our Journal" would secure just one other reader we would have just twice the number of readers that we have now? And if we have more readers we can give you more reading matter, a bigger paper and a still better paper. Surely you know one other smith who will find profit and pleasure in reading "Our Journal". Surely you know of one smith who will be glad to subscribe when you tell him about "Our Journal." Call on your neighbor smith today and get his subscription order. Or if you cannot call on him, personally, write a letter. We make it worth your while.

If you will send us a new subscriber we will give you six months' credit on your own subscription, or

A genuine, guaranteed fountain pen, or
A rubber stamp and inking pad, or
A pocket level (Starrett make), or
A Burham safety razor, or
A Horseshoer's Chart of the Horse.

Will you allow us to send you one of these presents? We are counting on you—will you do it—this week?



NATURE'S WORK OF YEARS IS DEMOLISHED BY MAN IN A DAY



Hoisting Hooks

Their Correct Design and Proper Treatment

JOHN JERNBERG*

THE construction and treatment of a hook intended for a crane or hoist involves a problem deserving of careful consideration. This fact has impressed itself upon the writer from his experience in lawsuits arising from damages caused by the failure of a defective hook.

To make a hook safe for the purpose for which it is intended two important requisites must be fulfilled—

1. Correct design.
2. Proper treatment.

The design is guided to a large extent by the service which the hook is to perform; that is, whether the hook will be subjected to high or low, frequent or rare stresses, and whether the hook is likely to be loaded above its normal capacity.

Hooks on small cranes and hoists, of about 2 to 3 tons' capacity, may be loaded to full capacity several times every day; while hooks on cranes of 50 tons' capacity may carry full load at remote intervals only. Due to the repeated stresses on small hooks, occurring, possibly, under extreme temperatures, the hook may become fatigued and liable to break. It is, therefore, advisable to keep the stresses low in comparatively small hooks to provide a factor of safety.

This precaution can readily be observed with hooks for small loads, as the size would scarcely render them unwieldy. But as the size of the hook increases it becomes necessary to increase the stress; that is, the load per square inch of cross section, in order to avoid the construction of a clumsy hook. A high stress is permissible with high loads because they are applied to the hook

less frequently than in the case of small hooks and light loads. We may consider a stress of 15,000 lbs. per sq. in. as safe for a 50-ton hook as a stress of 10,000 lbs. per sq. in. on a 10-ton hook.

The material for a hook may be ordinary steel, cast steel or wrought iron; depending on the load the hook is to carry. For small loads

puddled iron. A steel hook may carry a load from 25 to 50% greater than the wrought iron hook, but it is not reliable. This fact will be borne out more clearly by the results of tests made by the writer and given further in this article.

The design of a hook should be based on formulae deduced from practice with successful hooks, rather than to depend on theoretical computations. In the latter method, conditions are assumed which are hardly ever realized in actual practice. It is, therefore, absurd to aim at mathematical precision at the expense of reliability.

The exact analysis of the stresses in a hook is based on the theory of curved beams. In the theory of straight beams it is assumed that any cross section which is a plane section before flexure will remain a plane section after flexure, and that the deformation is proportional to the stress. The analysis of a curved beam is based on the same assumption. There is, however, one important distinction which has been brought out by recent investigations.

Consider a straight beam loaded transversely with a load P , as shown by Fig. 2.

Originally, the fibers between the cross sections $a-b-c-d$ and $a'-b'-c'-d'$, were of the same length. When loaded, the fibers in the strip $b-c$, $b'-c'$ are subjected to compression; and the fibers in the strip $a-d$, $a'-d'$ are under tension; consequently, the upper fibers will shorten and the lower fibers will lengthen. Somewhere between $b-c$, $b'-c'$ and $a-d$, $a'-d'$, there must exist a layer of fibers which have neither shortened nor elongated. The intersection of

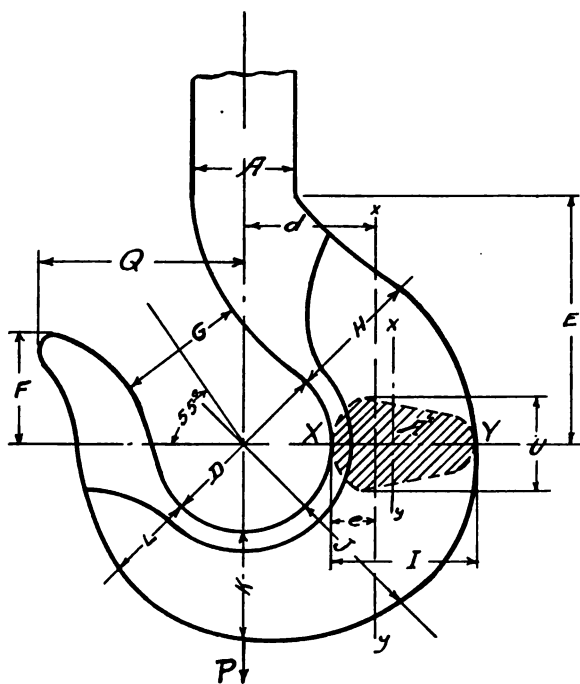


FIG. 1—THE CORRECTLY PROPORTIONED HOOK IS BASED UPON DEFINITE FORMULAE

where a hook of ample size, yet not bulky, can be constructed, cast steel may be used. But for heavy loads a ductile material, having practically the same elastic limit for compression and tension, should be selected.

Mr. F. A. Waldron, for many years connected with the manufacturing of hooks in the works of the Yale & Towne Mfg. Co., made careful observations with different materials, and his conclusion is, that the only reliable material for hooks is a high grade

*Instructor in Forge Practice, Worcester Polytechnic Institute



this layer with the section a''-b''-c''-d'' (the position of a'-b'-c'-d' when the beam is loaded) is a straight line (e, f) called the "neutral axis", which for straight beams coincides with the gravity axis of the cross section.

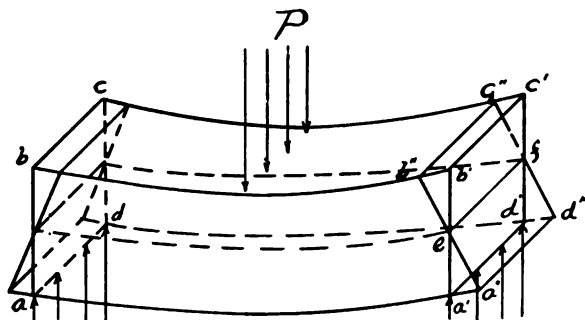


FIG. 2—THE HOOK CONSIDERED A BEAM WITH THE LOAD AT P

In a curved beam the neutral axis, x-y, Fig. 1, does not coincide with the gravity axis, x'-y', Fig. 1, but falls somewhere between the gravity axis and the tension side of the hook. This is due to the fact that the fibers on the convex side of the hook are longer than those on the concave side, and therefore require less stress than the shorter fibers for the same amount of deformation.

The application of the theory of curved beams is somewhat complicated for practical purposes, and a simpler form can be used; provided that care is taken in assigning the limits of stress. Referring to Fig. 1, assume the beam with a load P. The most dangerous section is, evidently, along X-Y; it is acted upon by a direct tension stress ($f' = P/A'$) and a flexure stress (f'') due to the bending moment ($P \times a$); the combined stress is the sum of f' and f'' . Let f represent the combined stress;

$$\text{then } f = \frac{P}{A'} + \frac{P d e}{I}$$

in which A' is the area of the cross section, e the distance of the neutral axis from the tension side, and I the moment of inertia of the section about the neutral axis.

If the material has, practically, the same elastic limit for compression and tension, the neutral axis needs not be far from the gravity axis; otherwise, it is advisable to distribute the metal more toward the tension side. The most reliable data on the construction of hooks, resulting from extensive experimental and mathematical investigations, is that given by

Mr. Henry R. Towne in his treatise on cranes.

The following formulae for determining the dimensions of the various portions will give the greatest resistance to spreading and rupture that the original bar will permit. Referring again to Fig. 1:

$$\begin{aligned} D &= .5 \Delta + 1.25 \\ H &= 1.08 A \\ L &= 1.05 A \\ U &= .886 A \\ G &= .75 D \\ F &= .33 \Delta + .85 \\ I &= 1.33 A \\ J &= 1.20 A \\ K &= 1.13 A \\ E &= .64 \Delta + 1.6 \\ Q &= .64 \Delta + 1.6 \end{aligned}$$

In the above formulae the dimensions are in inches; Δ is the load in tons of 2,000 lbs.

Having discussed, to some extent, the design of the hook, we may now consider the care which should attend the making of a hook. As already mentioned, the writer on several occasions gave expert testimony in lawsuits before the court arising from injuries incurred and damages

were made to determine how a hook should be made to insure reasonable safety and facilitate the location of responsibility in case of failure. The accompanying cut illustrates the results of tests made with 1-inch round stock hooks of different carbon content, as will be seen from the respective labels. All of these hooks were made in exactly the same manner, the only variable involved being the carbon content.

Referring to Fig. 3, some of the specimens are labeled "damaged in forging." This means that, during forging, the hook was slightly nicked at the concave side of the dangerous section. The nick, even as small as $\frac{1}{16}$ ", constitutes a very dangerous flaw, and should by all means be avoided. It is merely due to carelessness on the part of the workman, and can easily be caused by striking the hot metal when resting on a sharp edge of the anvil. Slight as such defect may seem, its existence has frequently caused damages exceeding thousands of dollars; while a little care in making the hook might have

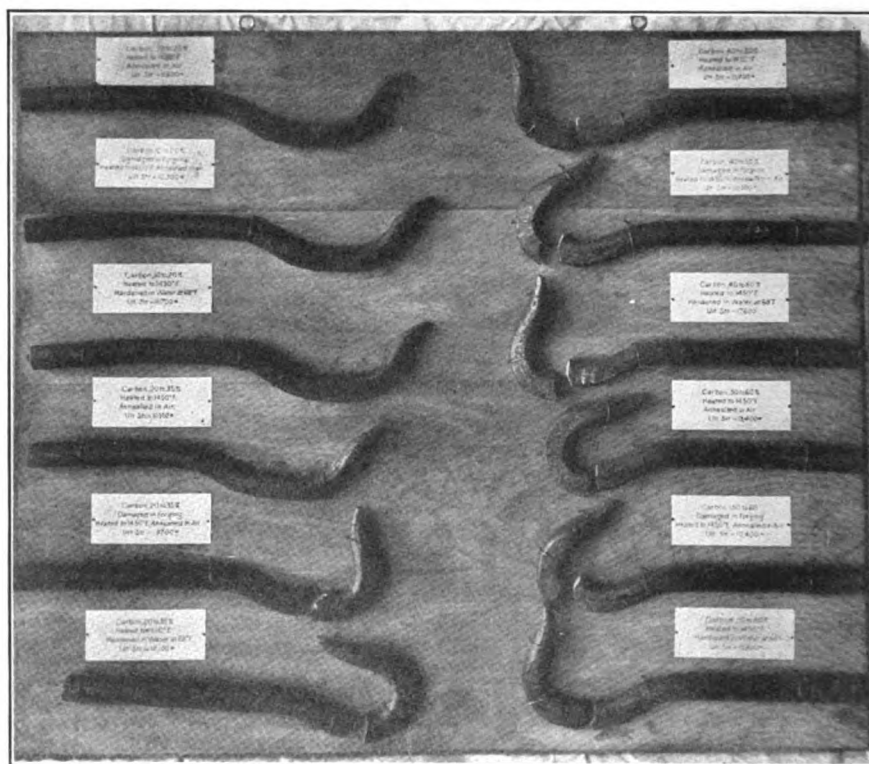


FIG. 3—ACTUAL TESTS OF HOOKS MADE UNDER VARIOUS CONDITIONS AND OF VARIOUS STOCKS WILL SHOW THE WAY

caused by the failure of defective hooks.

To investigate the subject thoroughly, a series of careful experiments

avoided such losses and other attending evils.

Referring again to Fig. 3, the first hook in the upper left-hand corner

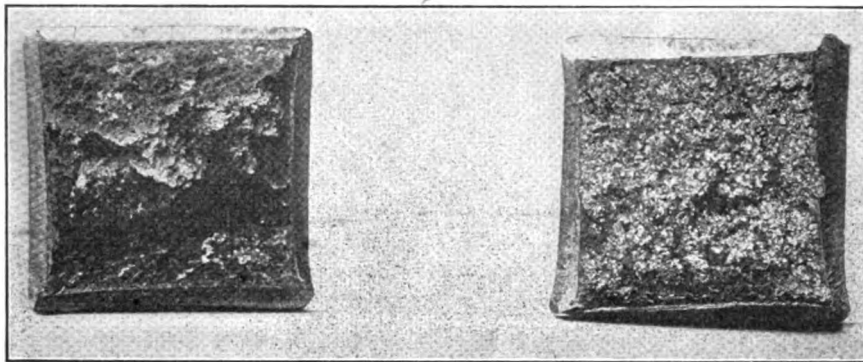


FIG. 4—THE PIECE ON THE LEFT WAS BROKEN AT 76° F. WHILE THAT ON THE RIGHT WAS BROKEN AT 7° F.

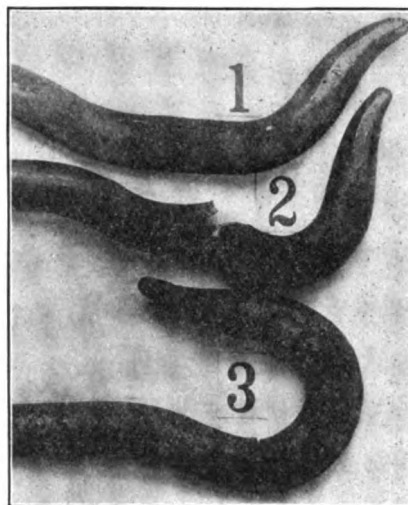
is a perfect hook, made of steel having a carbon content of .10% to .20%; the hook is heated to 1450° F., and annealed in the air. Its ultimate strength was 11,600 lbs. The next hook below is treated exactly like the first, except that it has been slightly nicked at the concave side, near the dangerous section. Its ultimate strength is only 10,300 lbs. The third hook is treated similarly to the first and second, except that it was hardened at 1,450° F., instead of annealed. The ultimate strength of this hook is raised considerably,—16,700 lbs., and one might infer that a hardened hook would be safer. As a matter of fact, the contrary is true. While a hardened hook may carry a heavier load it will break very quickly—with a snap—when the ultimate strength is reached, thus giving no warning whatever of the impending danger.

The rest of the hooks shown by the cut were treated in exactly the same manner as outlined above; the results can be seen on the respective labels.

Hooks may become hardened in course of time when exposed to extreme temperatures. Repeated stresses combined with extreme temperatures will change the molecular structure and, to some extent, the physical properties of the metal. This is best illustrated in Fig. 4. Two pieces were cut from the same bar; one was kept in a room where the temperature was about 76° F.; the other was exposed to a temperature of about 7° F. Upon breaking, the specimen subjected to the cold temperature showed a coarse, shiny, crystalline structure; it broke very easily as compared with the specimen kept at 76° F. It can be observed that the latter has a fine, fibrous

grain, with about five times the resistance to breaking.

The fact that chain links and hooks break more often in cold weather, suggests the advisability of annealing



HOOKS OF HIGH CARBON STOCK MUST BE VERY CAREFULLY WORKED. 1 IS A PERFECT HOOK, 2 IS A DAMAGED HOOK THAT BROKE, 3 IS A HARDENED HOOK THAT BROKE

chains and hooks at suitable intervals, to refine the grain which may have crystallized. A crystallized grain is always a weak grain and is especially objectionable where a sudden or "shock" load is likely to be applied.

In conclusion it may be remarked that the courts do not consider the correct size of the stock as the determining factor when locating the responsibility in case of accident. If it can be shown that the hook was too hard, overheated or too high in carbon, or there was a flaw in workmanship, there is undisputed evidence of negligence which constitutes sufficient ground for suit to recover damages.

There is a simple method for avoiding accidents by failure of hooks. If you buy or make your hooks, see to it that they contain the proper amount of carbon, and anneal before using; continue annealing, at least once a year, if the hooks are subjected to varying and extreme temperatures.

A Few Points on Forging Machines and Dies

WALTER STOCK

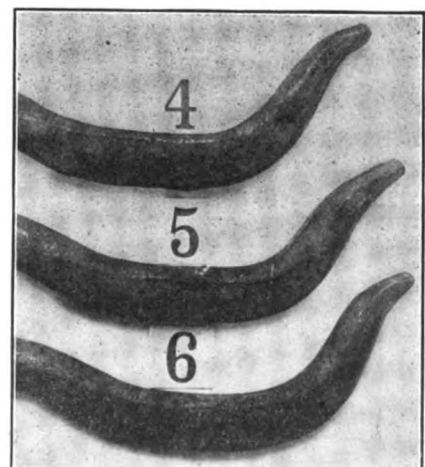
The forging machine is too well known as a money saver to require any comment as to its usefulness. The labor cost of the machine work on dies is not high, and the material is not expensive. There seems to be a growing tendency toward showing new dies and new ideas, which I believe is a step in the right direction.

It is not my intention to go very deeply into details of dies that I have used and which give good results, but in a general way I wish to express my opinion of what I consider good and bad practice in making dies.

It is not a question of how many dies a man develops, but how useful they are. Not how much a certain die reduces the cost of a certain forging, but how much actual money is saved each week or month by this or that particular die.

You may have a die that shows a saving of 150% on one forging, and yet that die may not save your company \$10.00 a month.

On the other hand you may have a die that only shows a saving of



LOW CARBON STOCK IS BEST. THE HOOK WILL OPEN BEFORE BREAKING EVEN THOUGH IT MAY BE DEFECTIVE AS AT 5



5%, but at the same time it may show a monthly earning of \$50.00 in real money.

A foreman blacksmith should never be satisfied until he has developed dies enough to keep his machine going all the time, and then he should give his master mechanic or shop superintendent no rest until an order is placed for another.

There is another feature in machine made forgings that does not receive the consideration it should, and in many cases is lost sight of altogether, and that is the reduction in the cost of machining forgings made in a forging machine. Forgings made in proper dies do not require as much excess material to allow for machining as hand forged, thereby saving considerable in labor cost as well as material cost.

Some Smithing Experiences

T. J. STEADMAN

A great many people are under the impression that all that is necessary is for them to tell the smith what they want—giving it some kind of a name—and leave the rest to him. Recently a man came into my shop and told me he wanted a mixer to mix paris green, meal and sand together. He didn't give me any idea or plan of what it should be like. Notwithstanding that I had never seen one (nor had he, I guess) he expected me to know just what he wanted; and when I asked him for ideas he laughed at me and said if I was a workman I could form my own ideas. Then he wanted to know what it would cost, even before I had any idea of what material to make the article.

A short time ago some work was sent to me by a man—we will call him Smith. I did the work, and when his boy called for it he told me to

send my bill, which of course, I did. Well, a month passed, and as he had not paid I sent him another statement; another month passed, still no remittance. I wrote him a letter with another statement saying that I was surprised I had not heard from my previous statements, and that I was sure there must be some dissatisfaction and, if so, suggested our getting together to adjust matters. "The dynamite was already set", and that letter "touched off the fuse." He sent a letter with check covering part of the bill; stating that he wanted me to have some peace and ease of mind, as he knew I would not as long as the bill remained unpaid, and finished by saying: "I tell you, Steadman, people don't have to worry themselves to death about what I owe them." Well, the next day I acknowledged receipt of his check and told him that when I learned my trade my instructor taught me to always strike while the iron was hot, and that working on cold iron was a tough proposition, hence my reason for striking while the heat was on. I guess he understood, for he sent the balance of the account shortly after that.

How I Built an Oxy-Acetylene Welding Outfit

ALBERT H. WAYCHOFF

A short time ago a neighbor put in an Oxy-Acetylene outfit, and the result was all my trade went that way. After writing all the manufacturers, I found the cheapest I could buy was about \$200, and I did not have the two hundred. All I could do was do without, but I finally decided to try making one of my own, and after some experimenting I built one which cost me

\$23.80 to make, complete, and with it I can do any work my competitor can with a machine for which he paid \$375. The highest welding

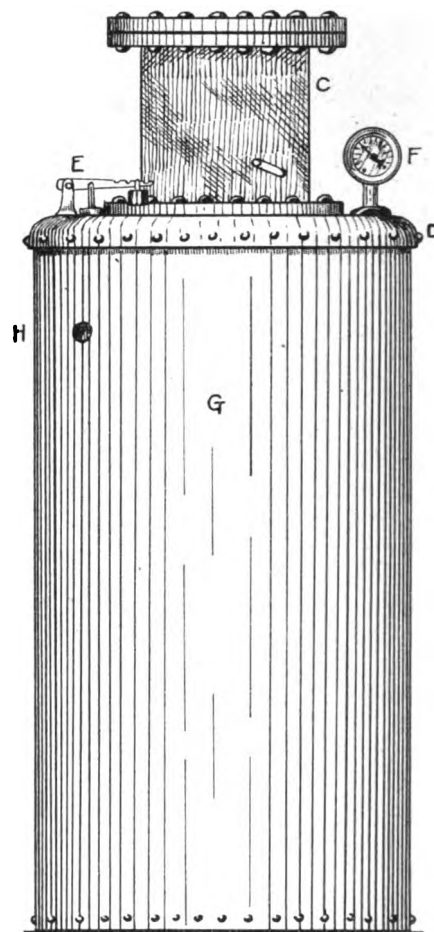
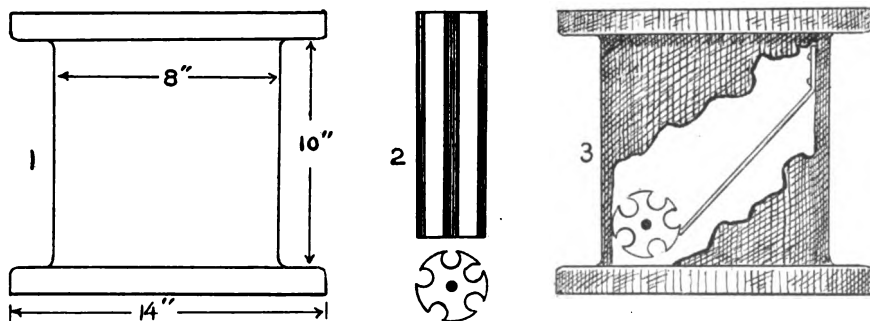


FIG. 4—THE ACETYLENE TANK AND GENERATOR COMPLETE

pressure needed is only fifteen pounds; and if there are no leaks in the outfit they are, in my estimation, as safe as a cook stove.

I will first show how I made the acetylene generators. I secured an old range boiler that was perfectly tight and had no leaks. This boiler was the regular height, such as any plumber keeps in stock, and 24 inches in diameter. I then had a pattern made for a top which was 8 inches square and 12 inches high, with a round flange on each end. This pattern was made of 1-inch lumber. I then took this to the foundry and had a casting made as shown at Fig. 1. The square is 8 by 8 by 10 inches high and the flanges are 14 inches in diameter. I then made another pattern and had a casting made as in Fig. 2. This piece is nothing but a casting 3 inches in diameter and 8 inches long, with five slots the full length each 1 inch



FIGS. 1, 2 AND 3—SHOWING DIMENSIONS AND CONSTRUCTION OF THE CARBIDE HOPPER



deep. I then took a piece of flat spring steel and put it in the square hopper, sloping down against the roller as at Fig. 3. The roller is held in place by a shaft in each end, $\frac{1}{2}$ inch in diameter. This makes the carbide hopper. The carbide is placed on the top of the spring steel; as the roller is revolved the slots get full of carbide, and as they pass the spring it scrapes it all off except that in the slot, which drops down through in the water, making the acetylene gas. When finished, the generator appears as at Fig. 4. A flange should be bolted on top, as shown, which can be removed to put in a new supply of carbide. In the illustration A represents the roller; B the steel plate; C the hopper and D the top of the boiler. This top has a hole 8 inches square cut in it where the hopper is bolted on. E represents a small safety valve; F a pressure gauge; G the boiler and H is a $\frac{1}{2}$ -hole with a short pipe screwed in at which to attach the hose. This makes the generator complete.

In making the generator, bolt the hopper on the top; using good rubber gaskets between joints to make them absolutely tight; so there will be no gas leaks.

To use; fill the boiler half full of water and fill the hopper with carbide. Then bolt on the top and turn the roller past one notch. This allows a small quantity of the carbide to drop in the water generating the gas. Turn the roller gradually till the pressure gauge shows fifteen pounds; then by turning a notch occasionally you keep the pressure up.

The oxygen generator is made by taking a piece of 5-inch gas pipe 12 inches long; screwing a flange on each end and then bolting a plate on each end. This is then put on a small stand as in Fig. 5 and connected by a 1-inch pipe to the supply tank, which may be another range boiler like the acetylene generator.

The water in this tank should never come as high as the top of pipe at A. To make the oxygen; put one pound of black oxide of manganese and one pound of chlorate of potassium in the 5-inch pipe generator. See that the valve in the 1-inch pipe is open, then light the gasoline stove under the generator. The heat generates the oxygen and drives it over into the bottom of the tank.

From there the gas rises up through the water to the top of the tank; leaving all the impurities in the water. When the desired pressure is secured, turn the fire down. From 20 to 50 pounds' oxygen pressure is required, according to the style of work. On my outfit I put an extension rod to the welding bench so I could regulate the fire. The generators should be about the same distance from the welding bench as an anvil is from the forge.

Now take two pieces of good $\frac{1}{2}$ -inch hose, 10 feet long. These are to carry the gases from the generators to the torches. The torches were the hardest to get. I wrote to a number of firms who manufactured welding outfits, but they all wanted to sell me generators ranging in price from \$200 to \$1000. I finally found one firm who would sell me torches for

worth about a dollar, and charged 25 cents; and for an aluminum crank case for an automobile engine costing \$50.00 I charged \$10.00; yet it took no more time or gas to do the job.

I used two old tanks which are as good as new ones if they don't leak.

My complete outfit appears as in Fig. 6.

I have tried to make everything clear, but if anyone wants additional information I'll be glad to supply it. I would suggest writing to the manufacturers of complete outfits, as their catalogs give a lot of information on doing all kinds of work. A good outfit can be made for less than \$25.00, and you can get jobs, as soon as people know what you can do, that will more than pay you for your time and the outfit.

Another Remedy for the Apprentice Problem

L. E. PHIFER

I am writing in regard to a little matter which in my opinion, should not be overlooked. I have read a great deal in the paper about organization of those forge men whose only

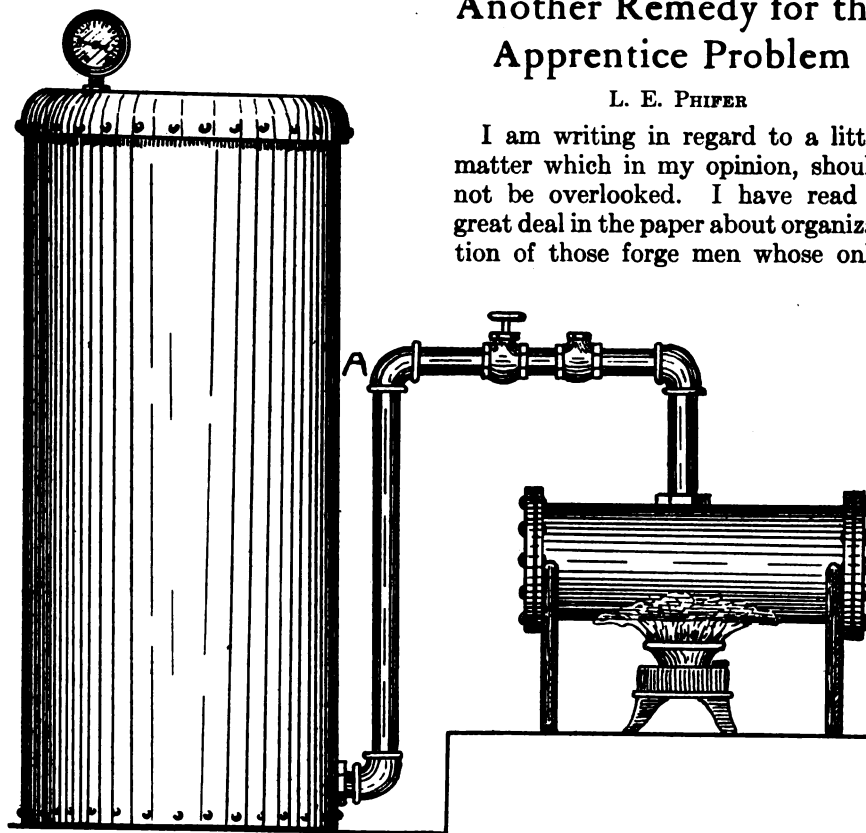


FIG. 5—THE OXYGEN GENERATOR AND TANK WITH A CUT-OFF VALVE AND ALSO A CHECK VALVE IN THE PIPE

\$5.00, and that made my outfit complete. With this outfit I can weld steel, cast iron, aluminum, brass, copper, or can weld any two metals together. The gases are very cheap. I generally charge one fourth the value of an article, and nothing less than 25 cents. For instance I welded a piece of a stove, the work being

music is in their anvils. We seldom hear of an organization of the employees; therefore the question, "Why don't the young men learn the blacksmith trade?" After serving their apprenticeship, a great many prefer to work for another smith, rather than start a business of their own. I find that after the young



man has nearly finished his trade, the employer seldom raises his wages and will invariably let him go for a cheaper man.

Now, my idea of an organization which would benefit both the employee and the employer is this: first, divide the country into districts, get the names and records of

for this job and splitting down the ends in halves as shown at Z. After the parts A and B are lined up (which takes quite a lot of time and trouble), the smaller cross pieces are drawn down to size.

Now, a better way to make this forging is to take a piece $3\frac{1}{2}$ inches wide and make an offset of 1 inch in the middle as is shown at Y. Then the piece is split as shown. This leaves A and B on a straight line to

inch in height on the smaller stock to $1\frac{3}{8}$ inch on the larger size. But these heights will do for many jobs. The only tools required are a bob punch and a piece of iron that has a hole in it large enough to admit the punch and plate freely. The hole should be rounding on the edges, so as not to tear or shear the plate as it is forced into the hole. With these tools ready, heat the plate to a good heat; place the center over the hole and

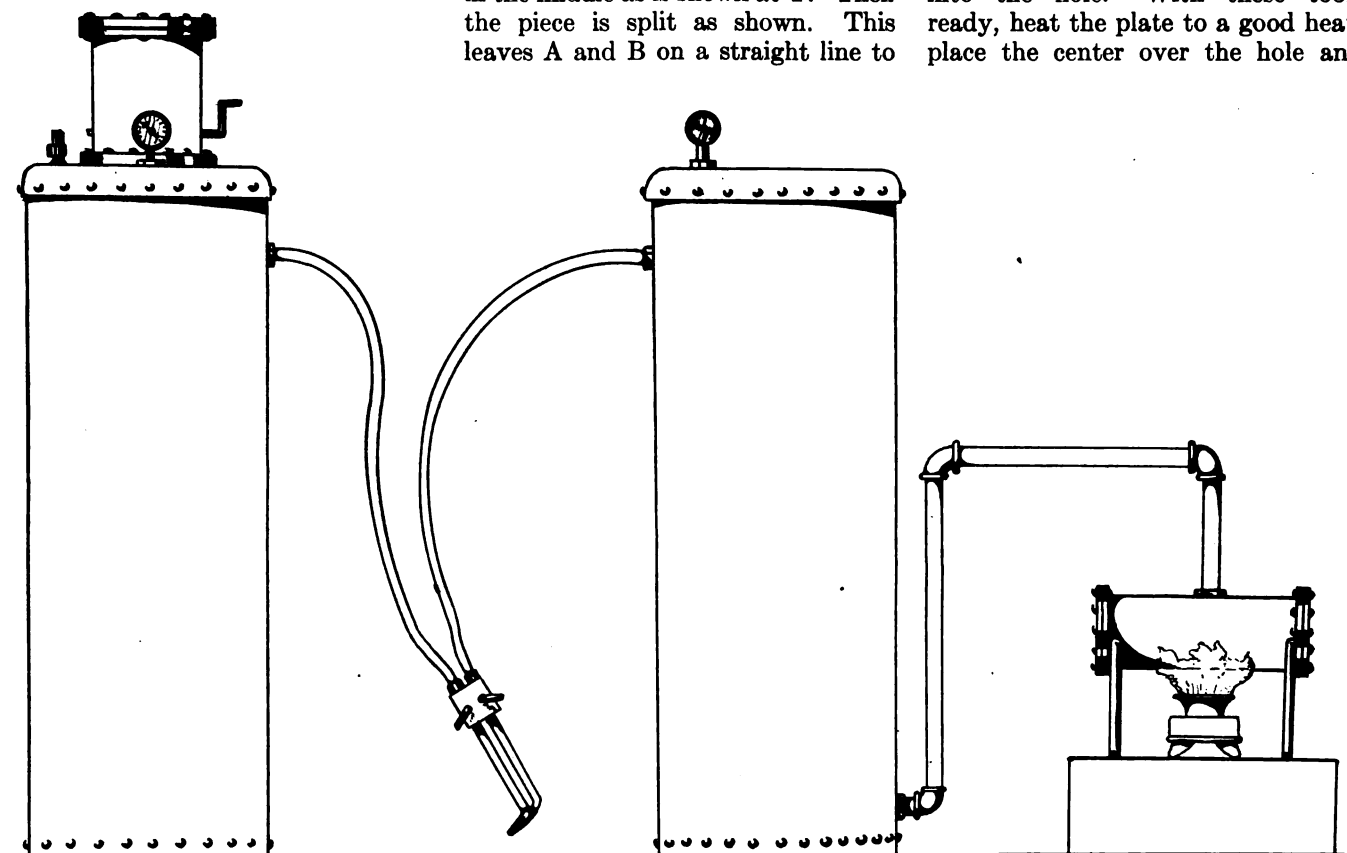


FIG. 6—THE OXY-ACETYLENE OUTFIT COMPLETE WITH GENERATORS, TANKS AND BURNER OR TORCH

all the blacksmiths and their employees, i. e., their dispositions toward their employees. Then get the journeymen to register and produce references to join the organization, the membership fee to be about one dollar per year. The record of the employers would show just what kind of a man you were going to work for; and on the other hand the employer would know just what sort of man he was employing. This would create a sort of mutual feeling between employer and employee; and in my opinion would be a benefit to the craft in general.

Two Forgings Simplified

BERT HILLYER

In making a forging as is shown in Fig. 1, at X, many smiths use the old method of taking a piece 4 inches wide

start with, and the other pieces being smaller, work easily into shape when spread apart from the heavier sections.

This method can be worked on almost any size stock; the main point is the offset, which must be as deep as the width of the smaller part. Forgings of this kind should be made from soft steel.

Light work is generally quick work, but the writer hardly thinks the reader will believe that a neat, light lug plate like the one in the sketch can be made in eight or nine minutes, until they try this method, and then they will be convinced that it can be done in less time. This method is used only on light, soft steel from $\frac{1}{8}$ inch to $\frac{1}{4}$ inch in thickness, as this size stock can be readily doubled up and opened out again without much trouble. The lug should not be much over 1

with bob punch drive a bulge down as at Y, Fig. 2. It may be necessary to heat it again in order to get it deep enough; if so, heat the edges the hottest, so as to draw the metal from that part. After it is bumped out sufficiently, double it over as at Z, with the bump in the middle. This round bump is then hammered flat, which makes the lug. It can be punched at this time or drilled afterward. Another heat is then taken, the doubled parts bent back straight again, and we have a neat little lug plate made in a short time.

More Capital

It isn't always more capital we need in order to do a larger business. Sometimes, and it's most times, too, we would be able to do all the



business we could handle by simply using our capital judiciously.

Capital tied up in big stocks is idle. It is making that stock cost you more every day. Even an extra discount on a big order may be absorbed before that material is used and again turned into cash.

Most horseshoers think that because horseshoes will keep indefinitely, too many cannot be purchased. Supposing, however, that instead of buying a year's supply you put in just enough to last you one month; don't you see how a small capital will enable you to do the same amount of business as the big amount necessary to purchase a year's supply?

So in wood stock, iron, steel, calks and pads. Don't lose sight of the fact that material must be used and sold before you can get your profit. If the season between the time of purchasing and the time of selling is too long, extra discounts, quantity rates and even legitimate profits may be absorbed. Keep your money working—don't let it lie idle in the stock room and stock racks.

Drop Forging: What It Is, How Done, and How the Dies are Made.

JOHN CUNNINGHAM

Drop forging at the present time is not only calling the attention of the more skeptical blacksmith, but is most interesting to the metal trades in general. The history of drop forging dates back some fifty years or more and is a subject upon which volumes could be written, but, strangely enough, very little has been done along that line.

The early history of drop forging shows us that more or less depended on the skill of the blacksmith. He was obliged to work out the material almost to the desired shape by hand, then with the aid of portable tools which were used in conjunction with the power and steam hammer the forgings were finished to uniform size. With the development of machinery along other lines, however, it was only natural that the same progress should affect the forging business. And so it has, for to my notion drop forging has developed to a greater extent and in its sim-

plicity even outstripped every other mechanical development of today.

While the railroad blacksmith deserves the credit for the original idea of drop forging; the sewing machine, shoe machinery, harvester machinery and automobile industries have been more instrumental than any other agencies in bringing stamp or drop forging to its present simplicity. From the fact that drop forging is purely mechanical (thus eliminating the skill and artianship formerly required by the blacksmith), the word simplicity clearly signifies the methods used, which effect a wonderful reduction in the cost of production (about 40 and in some cases 50 to 1).

Forgings can be made in greater variety and those that were most difficult or even impossible to finish over the anvil are done with apparent ease under the drop hammer. There seems to be no limit to design; they make any shape from a cocked hat to a fountain pen; and the best

doubt that new fields have opened to create a greater demand for forgings than would have opened had the mechanical world to depend on the former methods of hand forging.

Automobile Parts

In my search for information on this subject I am indebted for the following data to Mr. C. J. Jackson, foreman of the Atlas Drop Forge Works, Lansing, Michigan, where automobile work is made a specialty. The greater part of their output is consumed by the Reo Automobile Company of the same city. This plant is equipped with fourteen drop forge hammers, ranging from four hundred to four thousand pounds, fourteen stripping or punch presses which, of course, work in conjunction with the drop hammers. They have also two open frame steam hammers and a one-hundred-ton hydraulic press; all of which are used for the purpose of knocking down the heavier class of work.

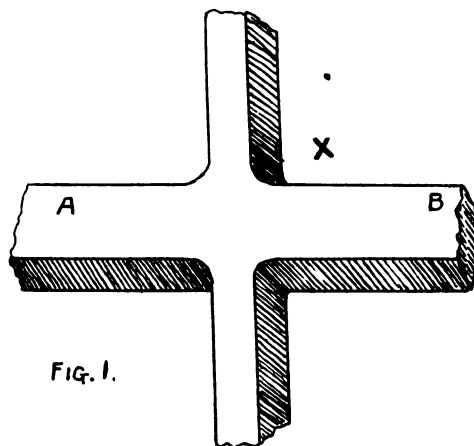
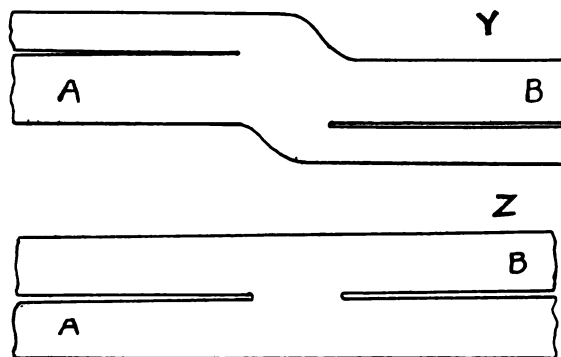


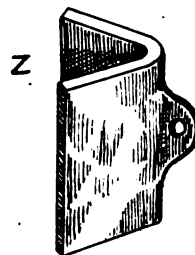
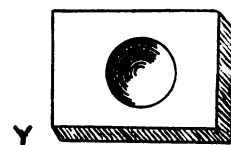
FIG. 1.



HOW TO MAKE TWO FORGINGS A LITTLE DIFFERENTLY THAN THEY ARE USUALLY MADE



FIG. 2.



feature of all is that the work is done more accurately; imparting a finish to every detail.

From the fact that, to a great extent, drop forgings have replaced malleable iron castings there is no

"Knocking down" is a term applied to the preparing or shaping of the work before it enters the dies of the drop hammer and is an operation in itself; the principal source being crankshafts which are made of square



stock cut to the proper length. The ends are drawn down under the open frame steam hammer, leaving sufficient stock in the center to complete the throw shaft, and with the same heat they are taken to the hydraulic press where they are bent to the required shape. This being done they are again placed in the furnace and heated for the drop hammer whose dies are an exact impression of the completed forging.

Square stock is used invariably for all classes of forgings; it being more practical than any other shape for drop forging.

For some forgings it may be necessary to work it down diagonally and in others from the flat surface, however it answers the purpose in all cases.

Material

No distinction is made as to grade of material; stamp forgings being made from all grades ranging from common iron to Chrome Nickel Steel. A great amount of this work requires from one to four operations or "steps" as they are called sometimes. Automobile axles, for instance; those made at this plant being forged from one solid piece. The first operation brings them to very nearly the desired shape, and although this may be accomplished with one heat it more often requires two, depending altogether on the ability of the operator. Then being reheated they are worked under another hammer using a different set of dies, where the centers are drawn to the proper length. After being heated all over

they are taken to the hydraulic press, and in a set of dies that are the exact impression of the completed forging they are straightened or curved according to the desired shape; and so it is with different articles; although in some instances four or five forgings can be made with one heat. When this is done the forgings are "cold trimmed"; meaning that after the forgings have become cold they are placed in the trimming press and the fin or flash sheared off, completing the work.

Shop Location

That good results in drop forging depend a great deal on the location and design of the building intended for this class of work is beyond doubt; for although the men do earn exceptionally high wages they work piece-work, and owing to the nature of the work, which is so extremely hot the average man can scarcely endure it, and unless the surrounding conditions are of the very best, it is very difficult to retain the services of competent help; and a good heater is as essential in producing the goods as is the hammer-man himself.

Therefore the location should be ideal. The highest spot should always be selected for this building where it would have the greatest access possible to fresh air and by all means a building by itself. The design should

be such that during the summer months the sides and ends may be entirely opened,—ventilation being as important as light. Steel framework throughout, with detachable sliding doors to correspond, is best suited for



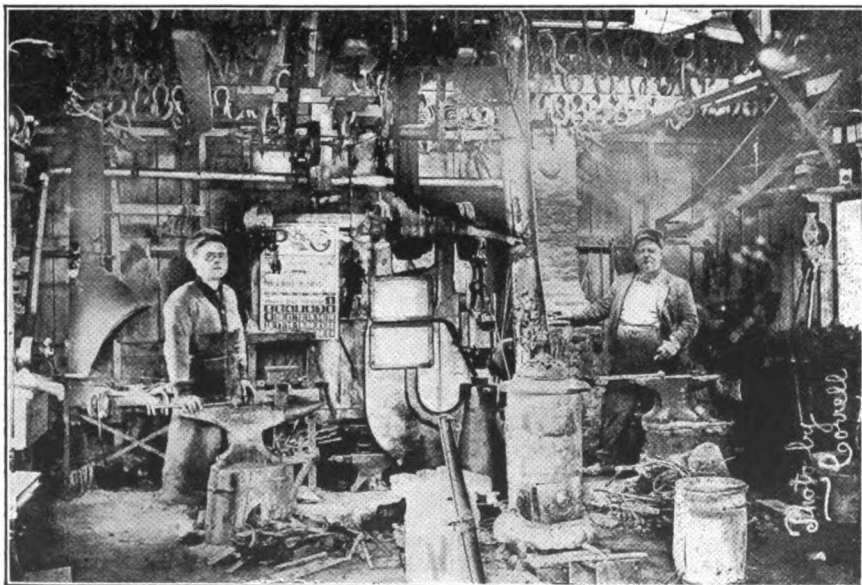
THREE GENERATIONS OF BLACKSMITHS—THE CORRELLS OF ILLINOIS—A. F., 85; A. A., 57 AND FRED. H., 35

this purpose and it should be at least twenty feet high from floor to girders, with a pitched roof. The building should be long and narrow, not over seventy feet wide, which will allow ample space for two rows of hammers and furnaces as well. The dies being very heavy, an overhead track system should be provided, both in front of the hammers for the transportation of dies from the die room to the forge shop, and vice versa.

A ram should be used for driving keys in and out of the hammer, and this track system could be used to great advantage in conveying it to and from hammers and also for swinging it. The layout and equipment is also an important factor in the good results obtained in these plants. Having visited a number of drop forge plants I find that the usual plans are two rows of hammers, one on either side of the shop, with furnaces as convenient to the hammerman as possible; leaving one end, that nearest to the die sinking room, free for hardening and annealing furnaces; also for acid vats and quenching tanks.

A great many forgings go through the annealing process and a great many that happen to be scaly go to acid vats where scales and dirt are loosened. Afterwards being turned in the rattler they are cleaned and polished.

As all hammer dies must be annealed and tempered before they are fit for service, special furnaces and



THE CORRELL SHOP OF ILLINOIS WITH THE CORRELLS IN HARNESS



tanks should be provided for these purposes and care taken to see that plenty of space is allowed for the handy manipulation of this work.

Although the Atlas people produce an enormous amount of forgings without the aid of forging machines or trip hammers I am thoroughly convinced that these machines are a very beneficial asset to any drop forging plant. Oil furnaces of the open type are almost universally used; yet at the Atlas plant two large coal furnaces of the reverberatory type are in use with a steam blast, the object being to prevent oxidation of the metal. At Hamilton, Ontario, the International Harvester Co. use steam blast in their oil furnaces very satisfactorily. The forgings are all under contract and are obliged to pass the most scrutinizing inspection; the most trifling flaw or even a scratch sometimes caused by a bad or rough spot in the dies is considered sufficient cause for rejection. Inasmuch as a great portion of this work is supposed to be finished before leaving the shop, the cost of machinery is very small compared with the cost of machining hand made forgings. A great many forgings go direct to the grinder and buffer only to be polished, and are then fit for service.

(To be continued)



Apologies to Power

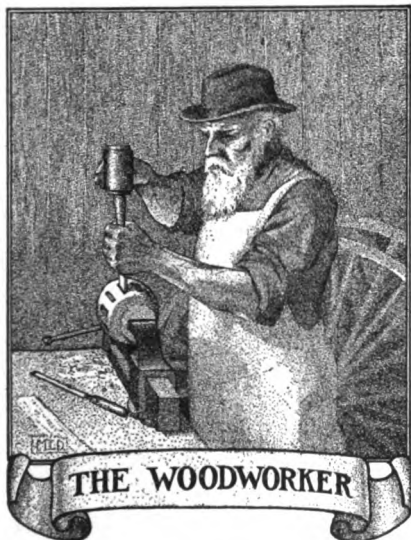
TWO WAYS OF GIVING INSTRUCTION—A "CALL DOWN" OR AN EXPLANATION—WHICH DO YOU USE?

are planed up and mortised to receive the tenons of the side rails and end rails. A mortise is also made in the two top end rails, to receive tenons of a bearing piece that carries one of the spindle blocks. The four top rails are each 6 in. by 3 in., and the bottom rails are 4 in. by 3 in. All the stuff having been planed, and all the tenons made, glue and knock the frame snugly together. Bore a hole in each leg and drive four $\frac{3}{4}$ -in. bolts, A, through them, and tighten up by means of nuts as shown in Fig. 2. These bolts, passed inside the rails, tend to make the bench rigid. The saw-spindle, B, runs in bearings C. The pulleys are shown at D, and E indicates the saw.

It will be seen that the saw end of the spindle runs in a bearing secured to a bearing-piece. A long screw is also shown at F, for adjusting the fence. Three bearings are shown. The outside bearing is secured to a small horse, G. By adopting the third bearing the pull of the belt will not have such a wearing effect on the bearings, and it will also reduce the racking strain in the saw bench. The bearing-piece referred to is shown in Fig. 3. The tenons fit snugly in the mortises made in the end rails, and are well wedged. The bearing-block, C, is let down in this

piece as shown, so as not to interfere with the table. The center bearing, Fig. 2, is let down likewise. Of course the outside bearing may be dispensed with, but is preferred. If the third bearing is adopted, which is advised, a small horse, Fig. 4, should be framed together to carry the bearing. The bearings are secured by means of bolts passed down through the rails and screwed up from underneath, as shown in Fig. 3. Care should be taken that the bearings are in perfect line, or there will be trouble with the working of the saw, etc.

A plan of the table is shown by Fig. 5. The handpiece, H, is removable, and rests on two cleats secured underneath the table. The slot, J, receives a cleat secured to the base of the fence. Underneath the handpiece and the table rabbetted pieces, Fig. 6, are secured for the length of the fore half of the saw. On these pieces the packing rests. The saw-gate is indicated at K. The holes receive screws to secure the table to the frame. A saw-spindle shaft may be $2\frac{1}{2}$ in. in diameter, and the total length (with three bearings) will be about 3 ft. 1 in., Fig. 7. The shaft should be turned down at C, so as to fit nicely in the bearings, and to prevent end-play.



How to Build a Simple Circular-Saw Table

Work

In constructing the circular-saw bench, shown by Figs. 1 and 2, oak is the most suitable timber to use.

The frame is made as follows: Four legs, each 5 in. or 6 in. square,



At L, Fig. 7, a collar-washer is shrunk on the spindle, and a hole is bored and tapped in this washer to receive a steady-pin, M. This pin passes through a small hole in the saw-plate. A thread is cut at the end of the spindle shaft to receive the nut, N; the washer, W, being removable. To secure the saw on the spindle, remove the nut and the washer, pass the eye of the saw over the end of the spindle, then screw the washer tightly against the saw-plate. Care should be taken that these washers are turned perfectly true and slightly concave. If the

that works on the adjusting screw. A winged nut screws on this bolt, securing the fence to the table.

An enlarged end view of the fence, with an appliance for supporting it, is shown by Fig. 10. This appliance will also allow the fence to be set at any angle. The small iron bracket, R, has holes in it to receive screws securing it to the fence. The standard, S, is secured to the base of the fence with strong screws. A small bolt is passed through holes in the bracket and in the slotted piece, T, which secures it to the bracket. A bolt with a winged nut secures it to the

be to cut two slots in the table and to secure two cleats to the base of the fence, these to fit nicely in the slots. An adjusting appliance is formed by a piece of iron securely fastened to the base-piece and turned down over the front end of the table with a long tapped hole to receive a long bolt, Fig. 11, which is suspended in iron brackets secured to the legs of the bench. This method allows the fence to be thrown back when cross-cutting is being done.

When ordering circular saws, the exact sizes of pin and spindle holes should be sketched, as in Fig. 12, and

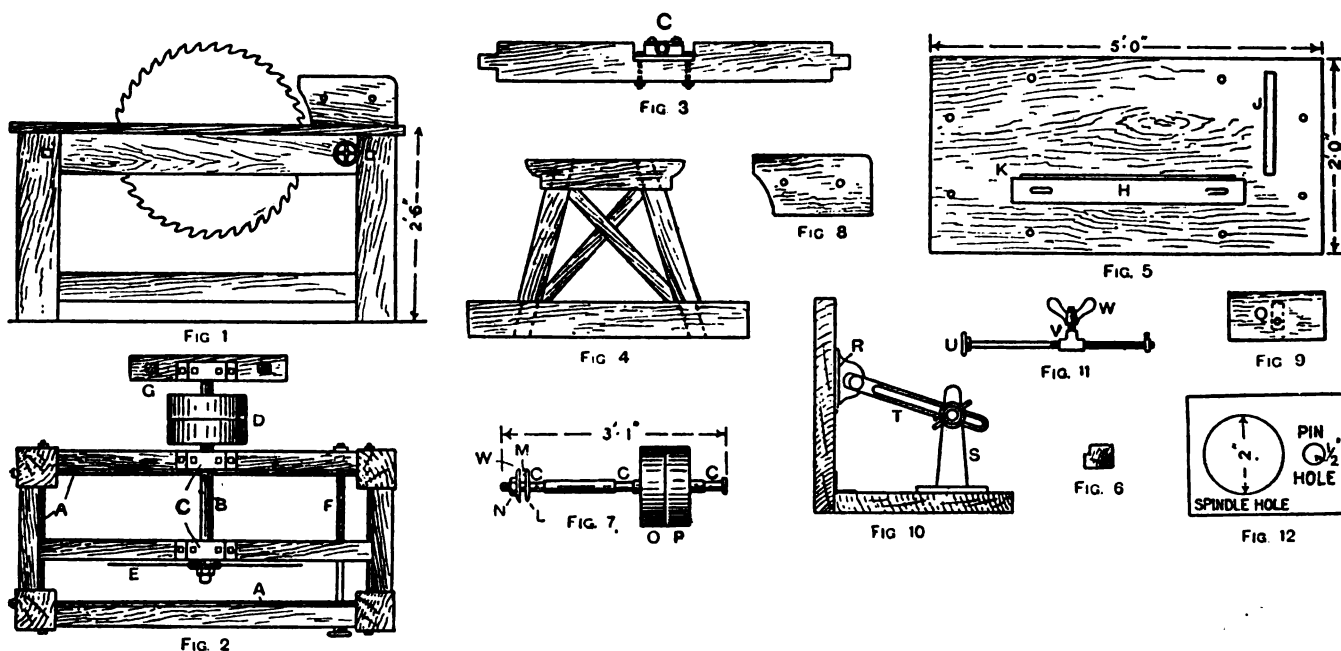


FIG. 1—SIDE ELEVATION. FIG. 2—PLANS OF FRAME. FIG. 3—BEARING AND BEARING SUPPORT. FIG. 4—END SUPPORTING HORSE. FIG. 5—TABLE. FIG. 6—PACKING PIECE. FIG. 7—SPINDLE. FIG. 8—ELEVATION OF FENCE. FIG. 9—BASE-PIECE OF FENCE. FIG. 10—ENLARGED VIEW OF FENCE. FIG. 11—ADJUSTING SCREW. FIG. 12—PIN AND SPINDLE HOLES

washers are in the least degree convex, trouble will ensue. Fast and loose pulleys are shown respectively at O and P.

A front elevation of the fence is shown by Fig. 8, and may be made from 1 1/4-in. beech. By securing the fence to a base-piece by means of butt hinges it may be set to any angle. The two holes shown in the fence are to receive bolts to secure a false fence when smaller saws are being worked. The base-piece of the fence is shown by Fig. 9. To the under-side of this piece a small cleat, as denoted by the dotted line, Q, is secured with screws. This cleat should fit nicely in the slot, J, shown in the table. See that the cleat is fixed perfectly square. A hole, shown in Fig. 9, is to receive a bolt

standard. Two of these appliances are attached to the fence as described.

A bolt, Fig. 11, is passed through holes bored in the top rails, see Fig. 2. Iron plates are let in 'round these holes to prevent the wood wearing. A hand-wheel, U, is keyed at one end; at the other end a collar is secured as shown. A bolt, V, works on the thread of the long bolt. This little bolt is passed through the slot, J, in the table, and through the hole in the base of the fence shown by Fig. 9. A washer is then passed down over this bolt, and screwed down firmly by means of the winged nut, W, securing the fence to the table. By easing the winged nut and turning the hand-wheel, the fence may be adjusted for cutting stuff of various thicknesses. Another method would

the sketches sent with the order. A good speed for a 30-in. saw will be 1,050 revolutions per minute. If the first motion is very slow, put in a counter-shaft, by which means the speed can be increased.

The dimensions of the bench here illustrated are suitable for saws up to 30 in. in diameter. If a drag motion is desired, bearings may be secured to the bottom rails to carry two small shafts, and brackets secured to the front and back legs of the bench to receive two small rolls to carry the timber that is being fed to the saw. The surface of these rolls should be a little above the surface of the table of the bench.

The June, 1912, issue (Number 9 of Volume 11) contained a description of and directions for making a similar



saw table with an adjustable top. This may be of interest to those contemplating the building of a table of this kind. The adjustable top table, while requiring more labor and time in the building, will perhaps be better suited to those woodworkers who have to work up a great variety of sizes.

Extension Trestles for the Smith and Wood Shop

JOS. W. HAAR

The engravings show a very handy piece of equipment for the smith and wood shop. Of course the dimensions can be altered to suit conditions in your own shop. I use lumber of the following dimensions: for the main part of the trestle I use a piece of 3 by 3½-inch stuff, 3 feet long. The legs which are 1 by 2½ inches and 2 feet long are let into this and bolted on. The crosspiece for the extension part is 2 by 2½-in. lumber, 3 feet long. The standards for raising and lowering the extension crosspiece are of 2½ by 1-inch flat stock and 2 feet long. Before fastening the standards in the extension crosspiece a number of holes are drilled in the standards, so that by means of the pins shown, the extension section can be held at any desired height within the range of the machine.

The standards are fastened in the extension crosspiece by forging down the end of the standards for about two inches at one end. The ends are then threaded; holes are then bored in the crosspiece at the proper points. Now with washers at the proper points the standards are firmly bolted to the crosspiece. The square holes or slots in the main part of the trestle should be of such size as to

allow the standards to move up and down easily. If the ½-inch holding pins are attached to the trestle with small chains they will not become misplaced.



Benton Turns Several Recipes Loose

"Now, look here, Benton," began the Editor in mock severity, "those cigars cost money and I haven't had but one little recipe from you since you started that new book. I want you to get that new book out right now and give me some of those new stunts. I've got all morning, and you—well, if you want to smoke my cigars you've got to supply some recipes for this paper."

"All right, Mr. Editor," returned Benton. "Not that I think such a wonderful lot about these 'near-Havanas' of yours, but I am always willing to help the boys all I can with my hints. So shoot your questions and I'll come back at you with some of my recent discoveries."

"That's the spirit, Benton," admitted the Editor, "now let us get right down to business. The first thing I want is a new firepot mixture for forges. One of our friends in Ohio says he has used several different mixtures, but he is looking for something that will last for three or four days, anyway. I wonder if you haven't got just the thing this man wants?"

"I got just the thing that chap wants. Billy Evans, down near Scranton, told me he had a lot of trouble with firepot mixtures, but he kept right on experimenting until he got a clay mixture that will outlast anything he ever heard of," and Benton got out his book and read: "Take twenty parts, by measure, of fireclay; an equal number of parts of cast-iron chips or turnings; one

part of common salt and one half sal-ammoniac. Mix thoroughly while dry and then gradually add enough water to make about the consistency of mortar. This is spread in the firepot and then allowed to dry. A gentle fire of small wood or chips will assist the drying, and one good hot fire will glaze it and make it practically indestructible." Closing his book, Benton continued, "Evans told me he has been using that mixture for several years. While I was down there one of the men was relining a firepot; he placed a block of wood in the opening of the tuyere and with a trowel shaped something like a garden trowel—that is curved instead of flat—he slapped that new lining into place in very quick time."

"It sounds good, Benton," said the Editor, turning to the next question. "This next questioner wants to fill up some holes in a casting. He says he has tried several mixtures, but they don't seem to get sufficiently hard. What can you offer him?"

"I believe I have a mixture that will just meet his requirements," said Benton, turning the leaves of his note book. "Here we have it:—Take nine parts of lead, one part bismuth and two parts antimony and melt all together. Now clean out holes to be filled and warm them slightly. Then pour the alloy into the holes and allow to cool. This mixture expands slightly when cool and fills the hole solidly."

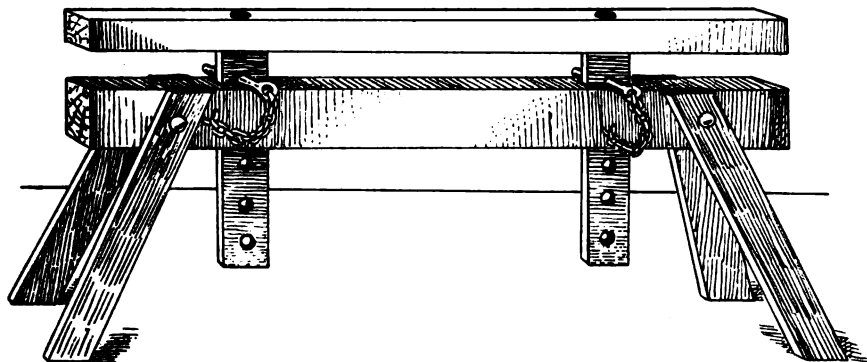
"That's fine—that new book seems to be making good," and picking up another letter the Editor read: "'I would like to know if it is possible to copperplate iron without the use of the electric current.' That question is beyond me, Benton—can you suggest anything?"

"Yes, Will Jennings, over in the Cleveland shops of the J. M. C., told me quite a neat little stunt," and Benton again turned to his book. "He first polishes the iron very carefully, getting just as high a finish and surface as though he were not going to plate it. Then he rubs the surface with cream of tartar and then places the metal in a solution made of hydrochloric acid diluted with three times its volume of water and to which a few drops of sulphate of copper solution have been added. Allow the iron to remain in the solution for a few minutes and then remove and rub with a cloth. Then return to the solution and add a little more sulphate of copper. Continue in this way until a plate of copper has been deposited of sufficient thickness. The plate or coating formed is firm and durable."

"Here's a chap with a practical turn," began the Editor, taking up another letter. "He says he often has need of a brass fitting to make a repair; and while he can usually make the piece in iron he has an idea that if he could use some simple solution to brassplate such articles he would save himself lots of trouble. What can you do for him, Benton?"

"There are several simple solutions and methods he can use. Probably the one that is best suited for his purpose is a solution made of one quart of water into which a half ounce of sulphate of copper and a half ounce of protochloride of tin have been placed. The articles to be brassed are simply cleaned and then placed in the solution until the desired color is obtained. The articles should be stirred to get a good even coating."

"Well, Benton, you've done fine today—better light another torch while I look over these proofs and then we'll get some more of the good stuff out of that new book"; and the Editor turned to his proofs, while Benton needed no second invitation to try another cigar.



AN EASILY MADE EXTENSION TRESTLE FOR THE SMITH SHOP



The Only Way to Win

ANONYMOUS

It takes a little courage

And a little self-control,
And some grim determination
If you want to reach a goal.

It takes a deal of striving,
And a firm and stern set chin,
No matter what the battle,
If you're really out to win.

There's no easy path to glory,
There's no rosy road to fame,
Life, however we may view it,
Is no simple parlor game;
But its prizes call for fighting,
For endurance and for grit,
For a rugged disposition
And a "don't-know-when-to-quit."

You must take a blow or give one,
You must risk and you must lose,
And expect that in the struggle
You will suffer from a bruise.
But you mustn't wince or falter
If a fight you once begin,
Be a man and face the battle—
That's the only way to win.



You may be cutting your throat; think twice before cutting prices.

A horse in the shop is worth two on the road—and one dollar in the purse is worth two on the books.

Cuff Brasher says: "Sum fellers don't care what they say, an' neither does nobody else."

Tom Tardy need have no fear of his business making him hustle overmuch!—you see, Tom isn't much of a hustler after business.

Fine time right now to put in a good, profitable sideline—one to fill in the spare time and turn additional dollars into your pocket.

How would you like to work in Brazil? Down there blacksmiths receive from 3,000 to 5,000 reis a day—which in "good home coin" equals about \$1.30 to \$1.50.

How does it work as a collection follow-up? After you've sent him your bill, and you've received no response, just ring him up on the phone. Try it the next time you've got such a customer to deal with.

Profit is your excuse for being in business. If you don't make a profit you have no excuse for being in business. Make a business of being in business for the sake of profit.

When you hear of a farmer customer selling a good lot of his produce—present your bill. A smith should strike when the iron is hot. Get after your customer, quick, and before he has a chance to tuck the money away.

Before you find fault with a new machine, be sure you are not the cause of the trouble. Go over each part, carefully; read directions then apply your own good common sense to the problem, and—chances are it will be solved.

It takes a big man to see all sides of the price-cutting problem. But just put yourself in your competitor's place, and then remember that you are in business for the money you can make—you'll not go wrong, then.

Give the apprentice a chance. He didn't come simply to pick up bolts and nails. Give him a real job and show him how to do the work. You'll get more out of him and get more into him by treating him like an intelligent human being than by treating him like a dog.

Where would you be today if obliged to find out everything for yourself? When you hit upon something new—a new hint or kink or a new method—pass the news along to "Our Folks." These columns and pages are always open to new ideas and new methods.

Run over, now—take this copy along. Your brother smith will be glad to see you, to talk over things in the trade, and if he's the right kind he'll be glad to give you his subscription. If you get it, we'll give you six months on your own subscription. Run over, now.

When you can demonstrate a machine, an implement or your own work in such a way as to make the other fellow feel just as you do about it you have found that knack which thousands would pay thousands for—that knack usually known as salesmanship.

Are you getting real good out of the business articles? Are you studying them and applying the examples to your business? Do the articles make you think? Let us hear from you and how these articles are meeting your needs. If you get help out of these articles, let us know; if you do not, tell us so.

Don't overlook that prize contest—get your letter in early. Think up something original and get a strangle hold on those fifty pieces of Uncle Sam's favorites. You can get a prize just as easily as the next man, and you have everything to gain and nothing to lose. You get your money's worth in any event.

It isn't necessary to suspect everybody, but do be careful about paying out money to strangers. A man with a persuasive smile and an oily tongue will promise anything to get your money. Better be sure before you hand out any of your good money. And, remember, some of the sharpers represent themselves as subscription agents.

In a large plant, the cost department stands between profit and loss; and in a small shop, costs are just as important. How do you figure costs? Do you know what your costs are? Do you know whether or not you are making a profit? Better know these things before you venture any farther on the sea of business. Read the business articles in "Our Journal," and THINK.

There is no objection to extending credit. It is the way some credit systems are run that we object to. Extend credit in a businesslike manner. There are several advantages to a credit business that should be carefully considered. But, above all things, go at this credit matter correctly. Don't give a man credit if he is no good. Look up his record before you put his name on your books.

You can preach, prattle and chatter on one subject for an entire lifetime, but if your listeners do not think about what you are saying you had better save your breath. To get real lasting good value out of the articles on business you must think, and think hard. Then apply the ideas to your own business, and work them out. Get all you can out of those articles; they will show you how to get all you can out of your business.

A French patent has recently been issued covering the production of two types of alloys from copper, zinc and silicon which are claimed to possess great tenacity, resistance to acids and alkalies and to be capable of rolling into finished shapes. Another new alloy has been patented, composed of iron, nickel and copper, which is claimed to be non-corrosive, malleable, of great tensile strength and capable of being rolled, drawn or cast.

Those charts we offer you free are practical and valuable aids to the practical craftsman. We want to get one into the hands of every craftworker who shoes horses or works steel. We know those charts will help you—that's why we offer them free; and we can offer them free, because it is worth something to us to have your renewal for two years—that's why we make it worth something to you to subscribe for two years. Look up the announcement of these free charts in the advertising section, now, and then get one or both of those charts.

When the days are dark, when friends turn against you, when your best efforts, put forth with conviction and certainty, meet with failure, and all the world seems pitted against you, think of these words of Lincoln:

"Let us have faith that right makes might, and in that faith let us dare to do our duty as we understand it."

"I do the best I know how—the very best I can—and I mean to keep doing so until the end. If the end brings me out all right, what is said against me won't amount to anything. If the end brings me out wrong, ten angels swearing I was right would make no difference."



Our Honor Roll

Forty-Seven

new names have been placed on Our Honor Roll this month; and two of those forty-seven are in the 1923 class. But we have had to take the January, 1916, names off. You see, we must take off the "tail-enders," or the list would get too long, and we cannot really devote more than just this page to such a list. So get a place well up toward the head of the list. Best get into the 1923 class;—it's easy. Just send us a ten-year remittance; you make a big saving and your name is placed right up amongst the leaders. Do it now and save money. You know a thing that will save you money tomorrow will save you money today, and the sooner you take advantage of it the more money it will save you. Our long-time rates are Big Money Savers.

	U. S. and Mexico	Canada	Other Countries
Two years.....	\$1.60	\$2.00	10 shillings
Three years.....	2.00	2.70	14 shillings
Four years.....	2.50	3.20	18 shillings
Five years.....	3.00	3.75	1 pound
Ten years.....	5.00	7.00	1 pound 14s.

NAME	Subscription Paid to	NAME	Subscription Paid to
W. C. WATT, Kan.	Dec., 1930	D. C. FOLEY, Cal.	Jan., 1918
I. J. STITES, N. J.	Jan., 1928	GILSON BROS., La.	Jan., 1918
W. R. TURNER, Mar.	Oct., 1923	C. E. KRUG, Wis.	Jan., 1918
W. SCHOONOVER, Pa.	Apr., 1923	G. E. WOODARD, Kan.	Jan., 1918
T. BRADLEY, N. S. Wales	Mar., 1923	P. J. DALLY, W. Aus.	Jan., 1918
I. T. NEDHAM, Ill.	Feb., 1923	J. MORROW, Pa.	Jan., 1918
G. C. DISINGER, Miss.	Feb., 1923	F. PROCTOR, Tas.	Dec., 1917
J. WIEBER, Minn.	Jan., 1923	J. G. JOHNSON, Ill.	Dec., 1917
Z. A. ENOS, Kan.	Jan., 1923	F. E. EGLERS, Ohio	Dec., 1917
W. G. WISE, Cal.	Jan., 1923	C. T. FORREST, Cal.	Dec., 1917
S. P. HARNET, Mont.	Dec., 1922	THEO. BUSH, N. Y.	Dec., 1917
P. BRECKNER, Okla.	Dec., 1922	J. T. ELLIOTT, Ill.	Dec., 1917
W. FREDERICKSEN, Iowa	Nov., 1922	J. VOELPEL, Ill.	Dec., 1917
L. O. LEUBA, Ill.	Nov., 1922	W. J. MAIN, Cal.	Dec., 1917
W. LAWSON, N. Z.	Nov., 1922	G. J. SAUER, Mo.	Dec., 1917
O. A. MORTIMORE, Idaho	Sept., 1922	MRS. BROS., Viet.	Dec., 1917
H. J. WYATT, Wash.	Sept., 1922	E. BLOOMER, Aus.	Dec., 1917
J. N. SKOW, La.	Sept., 1922	F. R. TOMLINSON, Kan.	Nov., 1917
A. D. STANDIFORD, Wash.	Sept., 1922	KAYS & AINLEY, Eng.	Nov., 1917
T. TINKLEWILE, Que.	Sept., 1922	T. H. ZIEGLER, Wis.	Nov., 1917
A. FRIEDER, Ohio	Aug., 1922	SCHOLLER BROS., Ind.	Nov., 1917
W. D. VALENTINE, Iowa	Aug., 1922	E. M. WUBSTER, Mich.	Nov., 1917
G. HOFFMAN, N. Y.	July, 1922	S. Z. FREY, Ind.	Nov., 1917
J. ERMAN, Ark.	July, 1922	B. A. STRINKE, Ohio	Nov., 1917
W. K. W. HANSEN, Pa.	June, 1922	N. N. BATHGATE, N. Dak.	Nov., 1917
ROBERT TOCHTER, Cal.	June, 1922	W. T. CUTCOMB, Iowa	Oct., 1917
J. VAN MARTER, N. Y.	June, 1922	J. DELAUS, Neb.	Oct., 1917
E. ANDERS & SON, S. Aus.	May, 1922	Geo. POTSCHEKE, Mo.	Oct., 1917
LOUISA CARRIAGE WKS., Va.	May, 1922	W. C. RONEY, Pa.	Oct., 1917
S. SMITH, Tex.	Apr., 1922	J. N. MILES, Ky.	Oct., 1917
J. W. HAAR, La.	Mar., 1922	W. A. WILSON, N. Z.	Sept., 1917
E. A. DILLON, Nev.	Mar., 1922	R. ROSS, N. S. Wales	Sept., 1917
D. W. SMITH, R. I.	Mar., 1922	I. E. SPROUD, Me.	Sept., 1917
D. F. KUTTER, Wash.	Mar., 1922	C. L. HOCKETT, Cal.	Aug., 1917
R. H. KEITH, Ia.	Jan., 1922	H. C. STENZEL, Tex.	Aug., 1917
O. M. JOHNSON, Minn.	Oct., 1921	M. DEJAGNE, S. Africa	Aug., 1917
H. FELDUS, Neb.	Sept., 1921	F. HOWARD, Kan.	Aug., 1917
W. K. KLINE, Kan.	May, 1921	H. FERRER, Ill.	Aug., 1917
T. F. CONBODINE, Mass.	Dec., 1920	J. McMEEREN, N. Z.	Aug., 1917
Ed. GRIMM, Tex.	Mar., 1920	F. H. CIERKE, S. Aus.	Aug., 1917
R. S. CRISLER, Ky.	Jan., 1920	F. G. STONE, S. Africa	July, 1917
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C. WILLIAMS, W. Aus.	Mar., 1919	W. R. GELLING, S. Africa	June, 1917
ROBERT COOK, Ky.	Sept., 1918	J. H. BAKERBERG, S. Africa	June, 1917
A. B. WENDLANDT, Wash.	Sept., 1918	A. R. HALLENBECK, N. Y.	June, 1917
A. J. BROOKMAN & Co., Vic.	Sept., 1918	F. C. BOCK, Neb.	June, 1917
PETER COCKE, W. Aus.	Sept., 1918	P. VANDERHAUGHEN, Mich.	May, 1917
R. J. TOMPKINS, Tex.	Sept., 1918	YOST & HALVORSON, Minn.	May, 1917
A. DISCHER, Aus.	Aug., 1918	W. MCCOT, Kan.	May, 1917
L. G. REID, S. Africa	July, 1918	A. GUTTLER, Tex.	May, 1917
WRIGHT & SON, Tex.	June, 1918	C. F. J. LORENS, N. Y.	May, 1917
ALBERT MELLUM, N. D.	June, 1918	A. DATWYLER, Ohio	May, 1917
H. L. HASWELL, N. C.	May, 1918	H. G. MARRIOTT, Utah	Apr., 1917
H. S. YONGUE, Wash.	Apr., 1918	E. THIBAUDEAU, Wis.	Apr., 1917
J. R. JEFFRIES, Pa.	Apr., 1918	W. PICKERING, S. Africa	Apr., 1917
R. COLVIN, Ind.	Apr., 1918	Ed. BURROWS, England	Apr., 1917
J. B. JEFFRIES, Pa.	Apr., 1918	L. KAUSCH, Wis.	Apr., 1917
AUG. HOLMAGEL, Ore.	Mar., 1918	J. M. BROWN, Tex.	Apr., 1917
A. E. UERLING, Wis.	Mar., 1918	P. RUPFER, Ill.	Mar., 1917
P. J. THORNTON, N.W.T.	Mar., 1918	G. STANSKE, Wis.	Mar., 1917
J. C. YOUNG, Pa.	Mar., 1918	W. H. MILLER, Mo.	Mar., 1917
D. C. HOUCK, Ohio	Mar., 1918	J. C. WOODS, W. Aus.	Mar., 1917
F. P. FELLOWS, N. Y.	Feb., 1918	C. BOULTON, N. S. Wales	Mar., 1917
J. W. STRADMAN, Ohio	Feb., 1918	C. A. HAWKINS, Ore.	Mar., 1917
J. P. HOLSAPPEL, Penn.	Feb., 1918	A. L. MONTGOMERY, W. Va.	Mar., 1917
E. N. GATES, Vic., Aus.	Feb., 1918	J. PETERSON, Ia.	Mar., 1917
RENTON WAGON WKS., Wash.	Feb., 1918	J. ANDERSON, Tas.	Mar., 1917
Writing Fdy. Equip. Co. Ill.	Feb., 1918	A. J. NEILL, Vt.	Mar., 1917
J. P. KOENIG, S. Dak.	Feb., 1918	Ed. DETTRICH, Ind.	Mar., 1917
RICHARD BRENNER, Tex.	Feb., 1918	LEWIS CHASE, N. Y.	Mar., 1917
W. F. HILL, N. C.	Feb., 1918	E. O. LEE, S. Dak.	Mar., 1917
W. MISCABLE, Queen, Aus.	Jan., 1918	S. STEMPLER, Ohio	Mar., 1917
S. PORTLAND, Que.	Jan., 1918	R. S. GUGIBERG, Kan.	Mar., 1917
		J. S. HASKELL, Col.	Mar., 1917
		W. L. ROARK, Tex.	Mar., 1917

NAME	Subscription Paid to	NAME	Subscription Paid to
A. R. BARLOW, Tex.	Mar., 1917	A. A. BAHKE, N. D.	July, 1916
C. A. WHITACRE, Ohio	Mar., 1917	ERNEST E. DOTY, Ohio	July, 1916
B. P. CARNET, Ill.	Mar., 1917	F. C. ASHTON, Pa.	July, 1916
T. J. DORSET, Conn.	Feb., 1917	HENRY FISHER, Tas.	July, 1916
F. MARSH, Mich.	Feb., 1917	J. W. FOWLER, N. Z.	July, 1916
J. H. WHITE, N. H.	Feb., 1917	A. C. LODWIG, Cal.	July, 1916
McGOWAN BROS., N. Y.	Feb., 1917	J. K. HANSEN, Aus.	July, 1916
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A. J. H. WEGENER, S. Africa	Feb., 1917	H. M. LARSEN, Wis.	July, 1916
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J. W. HAUGHT, Ill.	Feb., 1917	H. M. FINGER, N. Y.	July, 1916
CHAS. F. GIER, N. Mex.	Feb., 1917	L. H. STRANGER, Viet.	July, 1916
M. E. GOLLER, Pa.	Feb., 1917	P. O'DONNELL, Viet.	July, 1916
J. POTTHOFF, Neb.	Feb., 1917	R. J. HANCOCK, N. Z.	July, 1916
G. M. GARRETT, Mich.	Feb., 1917	F. G. WILSON, Calif.	July, 1916
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A. TILLMAN, Cal.	Feb., 1917	F. FULTON, N. S.	June, 1916
WALKER BROS., N. Z.	Feb., 1917	J. CHALMERS, S. Africa	June, 1916
G. W. WHITTINGTON, W. Va.	Feb., 1917	G. R. HARRISON, Aus.	June, 1916
J. H. HOYLE, S. Africa	Feb., 1917	J. WAYCICE, S. Africa	June, 1916
IRVING BROS., N. Y.	Feb., 1917	W. VOIGT, S. Africa	June, 1916
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AUGUST MILLER, Ill.	Feb., 1917	CHESTER HUMBERT, Wis.	June, 1916
C. P. ROBERTSON, S. Africa	Feb., 1917	LINCOLN UNDERHILL, Cal.	June, 1916
O. DANNEMAN, Minn.	Jan., 1917	M. BROTON, N. Dak.	June, 1916
S. HETEM, S. Africa	Jan., 1917	HANS ERIKSEN, Ill.	June, 1916
G. A. GURLEY, Ore.	Jan., 1917	C. MORRELL, N. Brunswick	June, 1916
F. K. WARD, Me.	Jan., 1917	J. O. CONRAD, Kan.	June, 1916
L. V. SMITH, Neb.	Jan., 1917	ADAM SCHMITT, Mich.	June, 1916
S. H. AUSTIN, N. Y.	Jan., 1917	J. G. REEVE, S. Aus.	May, 1916
H. KART, Ia.	Jan., 1917	I. H. LUNDE, N. Dakota	May, 1916
J. H. BERGEN, Kan.	Jan., 1917	JAMES SINCLAIR, W. Aus.	May, 1916
F. G. A. WILLIAMS, S. Aus.	Jan., 1917	H. BAKER, Aus.	May, 1916
W. DENSER, Mo.	Dec., 1916	E. Q. KREBSIEL, Kan.	May, 1916
J. B. SCHEIDLER, Ind.	Dec., 1916	C. H. CAIRNS, N. Y.	May, 1916
F. KUMMER, Ohio	Dec., 1916	P. V. JOHNSON, Ohio	May, 1916
ALFRED CASE, N. Z.	Dec., 1916	F. E. SMITH, Vt.	May, 1916
H. GRIMM, Utah	Dec., 1916	C. A. STEBBINS, Kan.	May, 1916
A. H. GOODING, S. Aus.	Dec., 1916	SANFORD BAKER, Mo.	May, 1916
LEONARD SMITH, N. J.	Dec., 1916	E. B. ANDERBERG, Ill.	May, 1916
C. F. SHAW, Mar.	Dec., 1916	PRATT INSTITUTE, N. Y.	Apr., 1916
W. ELWARD, Pa.	Dec., 1916	B. PETERSON, Minn.	Apr., 1916
W. W. EOLY, Pa.	Dec., 1916	H. R. HAYNES, Mo.	Apr., 1916
JOS. BOTYER, Mich.	Dec., 1916	S. H. AMES, Pa.	Apr., 1916
J. WILLIAMS, N. S. Wales	Dec., 1916	KARS BROS., Ill.	Apr., 1916
J. H. W. SCHNEIDER, Cal.	Dec., 1916	J. McGARVA, Ill.	Apr., 1916
W. SAUER, Minn.	Dec., 1916	G. H. SPINK, N. Y.	Apr., 1916
F. F. DARLING, Cal.	Dec., 1916	R. H. KUHN, Iowa	Apr., 1916
CHAS. NEWLAND, Cal.	Dec., 1916	WELSH BROS., Ind.	Apr., 1916
J. T. BRADY, Ia.	Dec., 1916	KELLNER BROS., W. Aus.	Apr., 1916
P. H. ST. LOUIS, Wis.	Dec., 1916	P. A. PETERSON, Ia.	Apr., 1916
A. E. NICKOLA, Okla.	Dec., 1916	G. F. BOWERS, Okla.	Apr., 1916
J. C. HALL, Wash.	Dec., 1916	D. E. McDONALD, Fla.	Apr., 1916
BOB FRICK, Ala.	Dec., 1916	JAMES BAXTER, S. Africa	Apr., 1916
JOSIE BROS., Tex.	Dec., 1916	E. P. DIGNAN, S. Aus.	Apr., 1916
R. CLEMENS, Conn.	Dec., 1916	W. H. WINGET, Vt.	Apr., 1916
SCHIFFLEY & SCHMITT, Pa.	Dec., 1916	L. E. TURNER, Kans.	Mar., 1916
A. BRUCE, Ohio	Dec., 1916	H. CORNELL, Ore.	Mar., 1916
J. E. BRATTY, Mo.	Dec., 1916	FAIRIED BROS., Mass.	Mar., 1916
GEO. CASSIE, Scotland	Dec., 1916	S. J. WARREN, Mo.	Mar., 1916
JOHN KAIN, Ky.	Dec., 1916	S. OLDING, Ohio	Mar., 1916
F. W. KOWELL, Ill.	Dec., 1916	W. T. HELBAECK, Ill.	Mar., 1916
H. A. GREYER, N. H.	Dec., 1916	C. M. MERITHEW, Mich.	Mar., 1916
W. M. GRIFFITHS, Aus.	Nov., 1916	O. MARTINSON, N. D.	Mar., 1916
W. B. TAYLOR & SON, Mo.	Nov., 1916	C. DECKER, N. Y.	Mar., 1916
G. WITTEN, Mass.	Nov., 1916	COLLIN MUNRO, Tex.	Mar., 1916
J. M. VINCENTA, Wis.	Nov., 1916	W. H. TUTTLE, Mass.	Mar., 1916
TOM NOLAN, S. Aus.	Nov., 1916	J. A. SEGARS, Me.	Mar., 1916
H. J. FRENCH, N. Z.	Nov., 1916	H. F. DISINGER, N. Y.	Mar., 1916
F. N. BROWNING & SON, Ky.	Nov., 1916	W. H. CRUMLY, Ind.	Mar., 1916
J. MACUAB, Scotland	Nov., 1916	M. C. THORP, Tenn.	Mar., 1916
P. GESSER, Ill.	Nov., 1916	D. BLYTHE, Iowa	Mar., 1916
J. W. GRIBBLE, S. Aus.	Nov., 1916	S. D. METZLER, Kans.	Mar., 1916
W. G. SIM, N. Z.	Nov., 1916	SHORT BROS., Iowa	Mar., 1916
H. V. RUEHL, Ala.	Nov., 1916	CHAS. WHITE, Penn.	Mar., 1916
G. LINDBERG, Ind.	Nov., 1916	W. LINCK, N. Y.	Mar., 1916
PITTMAN STELL, N. C.	Nov., 1916	J. J. HRACKOVEC, S. D.	Mar., 1916
J. S. FINKENBERG, Ind.	Nov., 1916	E. E. HOUCK, N. Y.	Mar., 1916
R. D. WILSON, N. Y.	Nov., 1916	E. A. PROUTY, Mass.	Mar., 1916
C. W. SCHMIDT, Cal.	Oct., 1916	GUST LENZ, Mich.	Mar., 1916
T. J. MAGUIRE, N. Y.	Oct., 1916	J. CLIFFORD, Minn.	Mar., 1916
A. W. WAITE, Cal.	Oct., 1916	J. GRIER, Mich.	Mar., 1916
C. W. ELLIS, Tex.	Oct., 1916	Geo. TEMPEL, N. Y.	Mar., 1916
J. P. SIMSON, N. S. Wales	Oct., 1916	G. W. BRYANT, Vt.	Mar., 1916
E. A. KNAPP, N. Z.	Oct., 1916	T. GAMSTER, N. H.	Mar., 1916
T. J. HASKINS, N. S. W.	Oct., 1916	P. F. HONSHOGEN, N. Y.	Mar., 1916
LOTHIAN & SKINNER, N.S.W.	Oct., 1916	T. J. HARVEY, Ill.	Mar., 1916
W. B. KNOUFF, Ala.	Oct., 1916	W. E. HART, Okla.	Mar., 1916
GORHAM BROS., Ia.	Oct., 1916	C. SCHMID, Neb.	Mar., 1916
W. H. F. BRAUCH, N. C.	Oct., 1916	J. SHARPLES, N. J.	Mar., 1916
CLARK OLDS & Co., Neb.	Oct., 1916	A. ROCKENSCUP & SON, La.	Mar., 1916
IRWIN SCOTT, N. Y.	Oct., 1916	C. H. ALEXANDER, N. Y.	Mar., 1916
C. E. DURHAM, Kan.	Oct., 1916	A. M. HAREBO, Wis.	Mar., 1916
M. RINGO, S. Africa	Oct., 1916	GEORGE HOWARD, Kan.	Mar., 1916
W. DELLEY, Queens, Aus.	Oct., 1916	G. N. FOLLMAR, Neb.	Mar., 1916
T. M. BLACKMAN, Pa.	Sept., 1916	W. WILLOUGHBY, Mich.	Mar., 1916
G. H. TORLINE, Kans.	Sept., 1916	H. HOFFMEYER, N. Y.	Mar., 1916
S. B. PHILLIPS, W. Va.	Sept., 1916	FRANK L. LOCKE, N. Y.	Mar., 1916
G. E. HARPER, Texas	Sept., 1916	FRANK L. EVANS, Conn.	Mar., 1916
J. J. ILLER, N. S. Wales	Sept., 1916	C. R. WINGET, Vt.	Mar., 1916
JAMES PORTGREN & Co., Mo.	Sept., 1916	H. & J. CHISHOLM, N. Z.	Mar., 1916
JNO. GORTINGER, Ia.	Sept., 1916	C. F. MOLENTEN, Aus.	Mar., 1916
Geo. FLECKENSTEIN, Cal.	Sept., 1916	H. D. PHILLIPS, S. Aus.	Mar., 1916
Geo. HILL, Aus.	Sept., 1916	J. B. FREY, Wash.	Mar., 1916
E. C. BEARD, Aus.	Sept., 1916	L. A. DOWNING, Cal.	Mar., 1916
J. K. GLINICKI, Mich.	Sept., 1916	T. BUTTS, Mich.	Feb., 1916
OSCAR BURNER, Md.	Sept., 1916	Ed. HARSTER, Mo.	Feb., 1916
A. J. HAMMOND, Cal.	Sept., 1916	T. TUTTALL, N. Y.	Feb., 1916
ROBERT MURRAY, Cal.	Sept., 1916	E. B. BEALS, Me.	Feb., 1916
D. E. WRIGHT, Pa.	Sept., 1916	R. SCHORER, Wis.	Feb., 1916
J. S. HASKELL, Col.	Sept., 1916	J. A. DAIR, Md.	Feb., 1916
R. SOMMER, Aus.	Sept., 1916	A. L. EDENS, Tex.	Feb., 1916
J. A. SEQUIN, Can.	Aug., 1916	R. E. SIDNER, Okla.	Feb., 1916
JAMES CLARK, Jr., Aus.	Aug., 1916	J. E. FRANK, Ind.	Feb., 1916
DISPATCH FDT. LTD., N. Z.	Aug., 1916	W. BEAUVIS, Mich.	Feb., 1916



Ten Questions for the Month

When a man has seen certain things happen day after day and year after year, through his life-time, he seldom questions the why or wherefore of them. And when a smith has seen iron and steel welded he seldom asks why the metals weld or why some grades of steel weld easier than others, or why still others do not weld at all. A smith finds himself treating steel every day—heating and cooling it to harden it and heating and cooling it to soften it. But the reason of why these things occur—why they happen as they do is seldom questioned.

In an effort to get our readers to question themselves more about the every day happenings in the smith-shop and beside the forge we have asked ten questions this month that may seem childish and simple, but which we believe will set you to thinking—and that, after all, is the real reason for these monthly questions.

1. Why does steel harden?
2. How do you account for annealed steel being softer than the steel as originally cut from the stock bar?
3. Why is steel tempered?
4. What causes the tempering colors, so much used as a guide by the hardener?
5. What is meant by heat treatment?
6. A great deal is said about the injurious effect of sulphurous coal upon iron, steel and the smithing processes;—how does sulphur affect the metals heated in the forge?
7. What is iron? Steel? And how do they differ?
8. What is the use of a flux when welding?
9. What is the difference between wrought iron and steel?
10. What change takes place when iron or steel is burnt?

The answers to these questions will appear in next month's issue.

Answers to Questions in April Issue

1. The wall of the horse's foot varies from $\frac{3}{8}$ to $\frac{5}{8}$ of an inch at the toe and from $\frac{1}{8}$ to $\frac{2}{8}$ of an inch at the quarters.

2. The hoof is divided into three parts as follows: the wall, the sole and the frog.

3. The animal will swing his feet in a line parallel with the middle or center line of the body, i. e., straight forward.

4. If base-wide his feet will swing inward from the ground position and then outward from center line of the body. If the position at rest is base-narrow, the feet will be swung first outward and then in toward the center line.

5. The hoof or, properly speaking, the wall grows about $\frac{1}{8}$ to $\frac{1}{2}$ an inch per month, the average being about $\frac{1}{4}$ of an inch. Hind hoofs grow faster than front ones and the unshod faster than shod. And as a rule the hoofs of mares and geldings grow faster than those of stallions.

6. They prevent frog pressure, allow the wall to dry out and become brittle and hard, injure the joints by reason of the narrow support at three points instead of a support under all parts of the foot, impair the general health of the foot.

7. Six.

8. The canon bone, the long pastern, the short pastern, the two sesamoid bones and the pedal bone.

9. By clamps or hooks, by nailing across the crack and clinching, by attaching a thin plate over the crack, by means of screws screwed at right angles across the crack and by means of a strap buckled around the hoof.

10. They assist in preserving the moisture of the foot and, consequently, its elasticity and toughness. They do not make the hoof grow, except as the preservation of the natural hoof moisture promotes health and growth.

Protection for Kansas Blacksmiths and Wagonmakers

The wagonmakers and blacksmiths of Kansas are soon to be protected from the "dead beat." A bill giving the followers of these professions a first lien on any goods, chattels, horses, wagons, autos, or farm implements on which they have done work, passed both houses.

The lien is to amount to the full value of the services performed and material used. It is to be filed with the register of deeds and foreclosed

under the statutes in the same manner as chattel mortgages. The bill was written by George W. Wilson of Fredonia, the President of the Blacksmiths' and Wagonmakers' Association of Kansas, who has been in Topeka since January 13th, working for its passage.

"I would rather shoe horses and sharpen plows than to try to get another bill through the legislature," said President Wilson in relating his experiences in guarding the bill from death in committees or joker amendments in the senate. Mr. Wilson is a blacksmith of 42 years' experience.

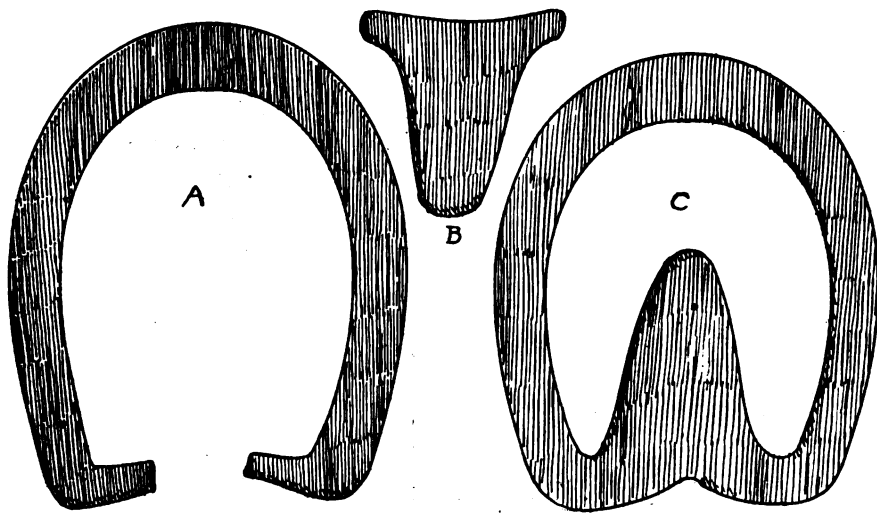


The Shoe Turning Contest at Batavia

Probably no event of less importance than the coming of a political candidate at the time of a national election could bring out the crowd of men that completely filled the Delinger theater on the evening of March 27th.

When the theater curtain went up, the scene was a blacksmith shop. There was no scenery and the big fire-proof doors in the rear of the stage, together with the brick side walls, made an appropriate background. There were two forges, two bellows and anvils, with other necessary equipment, set in the center of the stage.

Officers of the Genesee County Blacksmiths' Association and some guests from out of town sat on the right and rear of the stage. George Kelberer of Buffalo was judge, Anthony Schimley of Le Roy timekeeper, and Mayor Wiard the official announcer.



A SIMPLE METHOD OF MAKING THAT VERY EFFECTIVE AID TO FOOT HEALTH—THE BAR-SHOE

Mayor Wiard, in a dress suit, and the orchestra down in front of the stage were kept busy dodging big sparks the moment the first preliminary—the heel turning match between John Dietschler of Batavia and Anthony W. Knapp of Corfu—was started. John Tumalty of Alabama, who was scheduled for the contest, was unable to be present, so Mr. Knapp took his place at the bellows at the last moment. He was defeated by Mr. Dietschler in heeling eight shoes.

A. S. Pratt of Batavia defeated Jerome F. Ott of Batavia in the toeing match which followed, it being announced that his work was superior in quantity and quality. At the close of the match the smithies exchanged anvils and hammers and each tried to knock off the newly-placed toes of his opponent. There was plenty of vim in these efforts.

Everybody was waiting for the "final bout," as Mayor Wiard styled it. In announcing the contest the Mayor said that already a challenge had been received from A. H. Jones, of Chicago, who wanted to meet the winner for a side bet of \$10,000.

Mr. Ott, on the flip of the coin, chose his own bellows and anvil. He had A. S. Pratt of Batavia as helper, while Tom Heaman had A. J. Davy of Le Roy. The helpers came in for their share of applause, and a running comment was kept up between those on the stage and men in the orchestra, boxes and balcony.

Almost simultaneously the smithies each leaned over and dropped the first redhot and fully made shoe on the floor. These shoes had been made from straight iron bars and were ready to be put on the hoofs of horses. From that time on, the anvils made a din, sparks flew, and all four

men worked as though preparing to shoe a cavalry regiment in wartime. They didn't work too fast, however, for the smithies and others in the audience.

Mr. Kelberer, the master blacksmith from Buffalo, long experienced in judging such contests, said that as each smithy had made 30½ shoes, and as each completed shoe might be worn by a finely shod horse, he had no choice but to declare the contest a draw, and the announcement was so made. The number of shoes made was declared a fine showing, as 24 shoes are considered a record to boast about among expert blacksmiths.

NOTE—The Editor acknowledges his debt to Mr. A. S. Pratt, Mr. J. E. Dietschler and Mr. W. D. Storer for information and reports on the above contest.

Making a Bar-Shoe

H. L. BAUBE

I think my method of making bar-shoes will interest brother craftsmen—my method is somewhat different than any so far described.

First, I take a shoe of the correct size to fit the foot as in shoeing with an ordinary shoe. I then turn the heels in toward the inside of the shoe instead of down—see A, in the engraving. Now I forge a frog plate large enough to cover the entire frog. This plate is shaped up as at B. This frog plate is then welded to the shoe where the heels are turned in, and when finished the shoe appears as at C. This distributes the pressure evenly over the entire frog, as it should be distributed. I have had very good success with shoes made in this way. I have been using this shoe on the veterinarian's horse and also on a good many of the horses under his care and he likes the shoe better, he says, than anything in the bar-shoe line.

Three Common Diseases Affecting the Horse's Foot

H. C. WILKIE, F. R. C. V. S.*

Laminitis or "Founder"

Laminitis, or founder in horses, is an inflammation of the feet which is unfortunately much too common in New Zealand, and probably causes more misery to the unfortunate animals which are attacked by it

*Government Veterinarian New Zealand Department of Agriculture



THE WELL-BUILT, NEAT-APPEARING CANADIAN SHOP OF MR. A. THORNE IN ONTARIO



than any other disease to which equine flesh is liable. In the acute form it probably feels something like a very bad attack of gout in the toe would in the human subject if the patient had his foot in a very tight boot which could not be taken off. In the subacute and chronic stages it is undoubtedly a constant and never-ending source of misery. From the business point of view of the farmer I believe that if the results of injudicious treatment or neglect of treatment of founder could be expressed in money it would greatly surprise most people.

Before entering into a consideration of the disease itself it will be necessary for me to briefly point out a few details of the anatomical construction of the foot. In a section of a leg and foot of the horse cut directly down the middle you will see a central column of bones united together



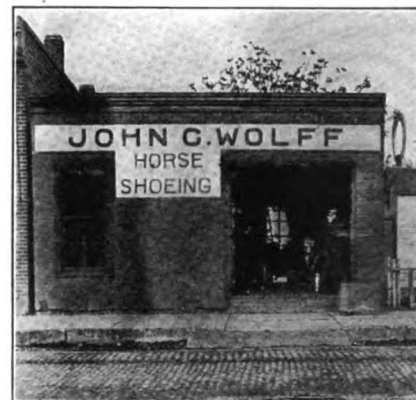
**NORRIS BROTHERS' INDIANA SHOP
IS KEPT BUSY SHOEING HORSES**

by ligaments, and having attached to them tendons by which the movements of the limb are effected. Outside this bone in the foot—the coffin bone—there is a red membrane, and outside this again is the hoof. Behind here you see a large yellow mass, which is a pad of elastic tissue, serving the purpose of a buffer to diminish the effects of concussion upon the foot and leg. The anatomical construction of the foot of the horse is an extremely interesting one, which I have no time now to consider in detail, but only to point out the existence of this red membrane and its connection with the hoof. This membrane is very richly supplied

with blood-vessels and nerves. It is intimately connected with the bone, and it consists of a number of leaves, or what are called the sensitive laminae. These leaves, or laminae, of which there are between five and six hundred, are shaped something like fern leaves, and they dovetail with similar leaves of horn which are situated upon the inside of the wall of the hoof. On the sole the connection between this membrane and the hoof is not by means of leaves, but by very tiny rounded projections called papillae, and here, on account of its feeling like velvet to the touch, it is called the velvety sole. The horn on the wall of the hoof consists, roughly, of three parts: an outer thin varnish-like layer, the periople, which gives the natural unrasped hoof its bright glaze; a middle thick layer of horn, which is manufactured by the rounded portion near the coronet; and the horny laminae, which are manufactured by the sensitive laminae. At the toe, the blood-vessels are most numerous, and this fact has an important bearing upon some of the phenomena seen in founder.

Laminitis, or founder, means essentially an inflammation of this red membrane which is confined between the bone on one side and the hoof on the other. Like most other things which are inflamed, this membrane swells and, as you can understand, there is not much room for expansion. As a result of the inflammation a watery material, or exudate, escapes from the weakened vessels, and this again adds to the pressure. The vessels being most numerous at the front part of the toe, it is naturally here that the greatest exudation occurs. The pressure of the exudate cannot push out the horn, but if continued long enough it gradually pushes the toe of the bone downwards. The pressure of the bone upon this portion of the sole is sometimes so great that the velvety sole here is destroyed; the horn, which it normally manufactures, becomes degenerated and softened; and if the pressure of the exudate upon the toe of the bone continues there is gradually a condition of dropped sole, and afterwards, if the disease remains unchecked, the bone makes its appearance through the sole of the hoof. The condition of dropped sole, which most of you have seen as a result of

an attack of founder, is not only brought about in this manner, but is also largely due to the pressure of the exudate which at the same time takes place between the velvety sole and the horny.



**AN ELECTRICALLY OPERATED SHOP
OF INDIANA. MR. JOHN C. WOLFF
HAS SEEN EIGHTEEN YEARS OF
SMITHING EXPERIENCE**

The causes of disease are divided into two classes—predisposing and exciting. The predisposing causes are those which render an animal specially liable to an attack and, so far as founder is concerned, these may be summed up as everything which renders the sensitive laminae less able to withstand the effects of concussion and work. Heavy-bodied, plethoric horses which do little or no work, such as stallions and fat ponies, may be said to be good examples of a predisposition to laminitis. Bad shoeing, by placing the bearings on the wrong place, also predisposes a horse to laminitis. Weakening the foot by cutting away the bars and by paring out the sole diminish the resistance of the whole structure to concussion. The sole cannot be too thick. It is there to protect a very delicate part of the foot. The bars are part of the wall, and when allowed to remain intact offer an extended surface for weight-bearing. The wall of a shod foot, as it is not kept at its proper length by actual friction with the ground, requires a slight reduction every month with the rasp. The frog should not be cut away. It is intended by nature to come into contact with the ground. The external surface of the wall should not be rasped more than is actually necessary in finishing the clenches of the nails, because this is covered with the hard, varnish-like layer I have before mentioned,



the periople. This varnish is intended to prevent the evaporation of water from the hoof, and if it is constantly rasped away (it is a very thin layer), the horn rapidly becomes dry and brittle.

The exciting causes of laminitis are concussion, as in excessive or over-fast work on hard roads or tracks and in unconditioned young horses when first put to work on city streets; over-exertion and consequent exhaustion from long drives in horses unaccustomed to much work; long standing in a constrained position, as seen in the laminitis which occurs on board ship; as a complication to other diseases, seen in some cases of pneumonia, etc. Certain disordered states of the stomach sometimes cause laminitis, especially in heavy-bodied horses. It is frequently produced by feeding with certain kinds of grain, of which wheat is, I think, the worst, and barley next. I have had some very bad and very intractable cases of founder produced in this way, more particularly where a horse had accidentally got at a sack of wheat and eaten his fill of it. A bad form of founder sometimes occurs in mares soon after foaling. In my experience these are usually mares in good condition, which have foaled naturally and without assistance, but in most cases the afterbirth has not been wholly got rid of. Frequently these cases are very intractable, but this is to a great extent due to the fact that in the majority of them the disease has not been recognised early enough to cut it short by immediate remedial measures. Laminitis should always be remembered as a possibility and watched for in mares which are ailing in from a day or two to a week after foaling. I saw several very severe cases of laminitis last foaling season which had not been recognised at all, and the feet had never even been thought of until I pointed out that this was the whole and sole source of trouble.

Symptoms

Laminitis shows itself in the first place by an interference with ordinary locomotion of the horse. In an acute case the temperature rises rapidly, frequently as high as 106° F., the pulse becomes quick, hard, and full, and the respirations much accelerated. The visible mucous membranes become injected, the expres-

sion of the face indicates acute suffering, while sweat breaks out over the body. The affected feet are relieved in every possible way of bearing weight. They are usually hot and dry. The appetite is nearly or quite lost, but thirst is very great, and in ordinary stables, where water is not kept before the horse, the provision of a copious supply of pure water is a matter of the greatest importance. In such an acute case, with both fore feet affected, the animal is sometimes called "set fast." The head hangs on the manger, the hind feet are brought well forward and the fore feet are extended, in order to place the weight on the heels and away from the sensitive, inflamed part, the toe. When both hind feet are affected they are still advanced under the body to allow the heels to receive the weight, and the horse stands in a heap. The fore feet in this case are kept rather backwards, to be near the center of gravity. When all four feet are affected, which is fortunately of infrequent occurrence, all the feet are advanced, and they are continually being raised and very carefully put down again while

but the majority of cases are at first really no more than a congestive condition of the sensitive laminae, and only become acute when not checked at this stage. In the congestive stage the temperature is frequently high, there is a good deal of distress, but the appetite is not usually lost. The feet are not usually perceptibly hot to the touch, but the manner in which they rest on the ground and the mode of locomotion indicate the parts affected.

Subacute laminitis is usually a termination of the acute stage, and is characterized by its slow course and its mild symptoms. This condition is also sometimes seen following a congestive condition, and without the incidence of the acute stage.

Chronic laminitis is usually the untoward result of the acute or subacute forms. The impairment of circulation due to the development of new connective tissue is gradual, and results in impairment of horn secretion. Spongy, crumbly horn, wanting in proper elasticity, results, the irregularity of the growth of which produces a sinking under the coronet and a number of irregular rings 'round the



THE KANSAS SHOP OF JAEGER & SON CAN HANDLE 'MOST ANY JOB

standing. In such a case the suffering is most acute, and the horse lies most of his time. In other cases the horse frequently does not lie at all, but stands persistently. When only one foot is affected, the general symptoms are not severe, but the foot is extended, with the heel pressed to the ground. When moving, the foot is either carried, or if it is put to the ground the whole weight is taken by the heel.

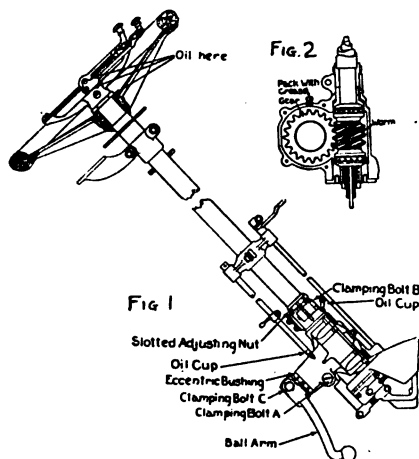
Such are the symptoms exhibited during the acute stage of laminitis,

wall of the hoof. The sole is down, more or less, and has become quite convex instead of concave. Such horses are always sore-footed, and cannot work for any length of time, if at all, on roads. On soft land, where the hoofs are kept frequently moist, they sometimes may be usefully employed.

The complications seen in acute laminitis are somewhat numerous, but I need not refer to these here, except to mention suppuration, or the formation of matter in the hoof. The



most common form of this is the suppurative of the velvety sole. It begins at the toe and spreads backwards, the matter escaping at the heel if not released by cutting through the horny sole. This is the least serious form of suppuration, as recovery takes place with treatment. Suppuration of the sensitive laminae



THE STEERING COLUMN AND ITS WORM AND GEAR

is a much more serious complication, and the whole hoof may in these cases slough off.

Treatment

The treatment of this disease necessarily depends upon the exact condition. In congestion of the sensitive laminae the feet should be placed at once in warm water to facilitate the circulation of the blood, but in the acute or subacute forms cold water should be used at once and, practically, continuously. The reason for this is that it is urgently necessary to check the exudation which I have mentioned as being the factor doing most of the subsequent damage. In simple congestion of the laminae there is little or no exudation, but there is a stagnation of the circulation, which if allowed to continue will rapidly cause exudation. If the horse is standing, there is no better form of foot-bath than a puddle of clay in which the water reaches well up to the fetlocks, but if he is lying down it is better to let him be, and apply swabs which should be thoroughly wetted with cold water every half hour.

The constitutional symptoms are best combatted by simple saline medicines, of which the sulphate of magnesia and the nitrate of potash are the best. In this disease large doses of both may be safely administered,

and from 2 oz. to 3 oz. of nitrate of potash may be given in water three times a day, with advantage, for a day or two. At one time this would have been considered to have been certain to irritate the kidneys, but I have not seen anything but good effects from it. When the fever is very high I have frequently given 4 oz. to 6 oz. of sulphate of magnesia and 2 oz. of nitrate of potash, three or four times, with great advantage.

With regard to bleeding, I think, speaking generally, this is much better left alone altogether. In heavy horses I have certainly seen a few cases which have appeared to be rapidly benefited by bleeding at the jugular vein, but I do not advise you to do this, as the treatment I have recommended will be much more generally beneficial. With regard to bleeding at the toe, this is one of the many things which theoretically appear to be correct, but practically are a failure. Whatever little benefit might accrue from the abstraction of blood from the toe is altogether overbalanced by the facts that you are weakening a part where you want most strength, and you are admitting air and destructive organisms to an inflamed structure.

Tincture of aconite is a medicine from which many horses in this colony suffer most miserably, and I advise you to have nothing to do with it. It is frequently given in cases of founder, as well as all sorts of other affections, and for one case where it is beneficial, from what I see as I travel round the country, there are twenty where it does injury. Many horses are more susceptible to the influence of this powerful drug than others, and what will be only a medicinal dose for some horses will produce symptoms of aconite poisoning in others.

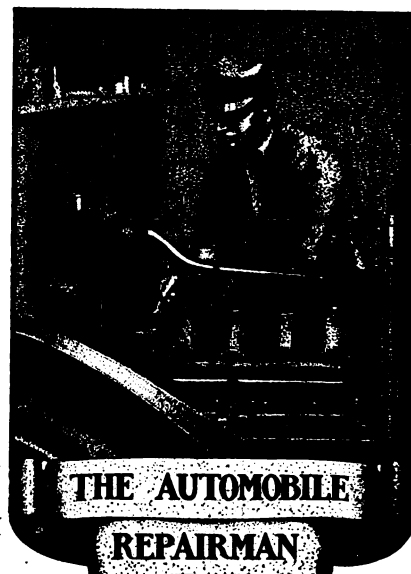
A most important part of the treatment of laminitis is exercise, and this should be given as soon as the subsidence of the acute symptoms allow of it. In congestion of the sensitive laminae, exercise may be given at once, and although the patient is unwilling to move at first he soon begins to walk much freer as the circulation becomes more active.

The best shoe for founder, and especially for subacute or chronic cases, is the rocker. This is a heavy and very thick shoe, with a thin heel. It is a bar shoe, made rather

long in the heels, and fitted rocker fashion, so that the horse can put his weight comfortably on any part of the foot he likes.

The sole of the hoof, either during the course of the disease or after, should not be greased or tarred over. The horn consists of a number of tubes which pass from the top to the bottom of the foot. These are open at the bottom of the wall and on the sole, and allow of a certain amount of evaporation and also of absorption of water. The tubes are extremely small, and are not absolutely empty, as they contain in patches a white albuminous matter. They can absorb water, however, but are not capable of taking up fats or oils to any extent, if at all. The different effects of water and oil on horn may readily be seen by soaking two pieces of a hoof, one in water and one in oil, for a couple of days.

(To be continued)



The Care, Repair and Operation of the Automobile—5*

(With Special Reference to Overland Cars)
Steering Gear

With continued use, the steering mechanism may indicate more or less wear by a looseness of the steering wheel. This wear is unavoidable, because the steering mechanism is in action at all times and performs considerable work in keeping the front wheels of the car in the desired direction.

To correct play in the steering gear, first jack up the front of the

(*Copyright by Willys-Overland Co.)



car so that the steering apparatus may be moved freely. Then loosen the two clamping bolts, A and B., Fig. 1. Now turn the slotted adjusting nut to the right until the steering wheel no longer has any lost motion.

Next turn the steering wheel hard around and adjust the worm gear by turning the eccentric bushing C. Make this adjustment with the steering wheel turned to the extreme right

are not rotating as a unit unless they are connected by the clutch end of a countershaft. On the countershaft there are three gears rigidly attached, one of which meshes constantly with the main engine shaft, which in turn connects with the driving wheels of the car.

The transmission shaft is squared, and on it there slides a double pinion, which by lengthwise movement can

speed gear into engagement with the rear reverse gear.

The fundamental requirement in every case is that the gears to be meshed shall be revolving at as nearly the same speed as possible. It is plain, therefore, that it is necessary to wait a moment or two after disconnecting the clutch before the next lower or higher speed is brought into play.

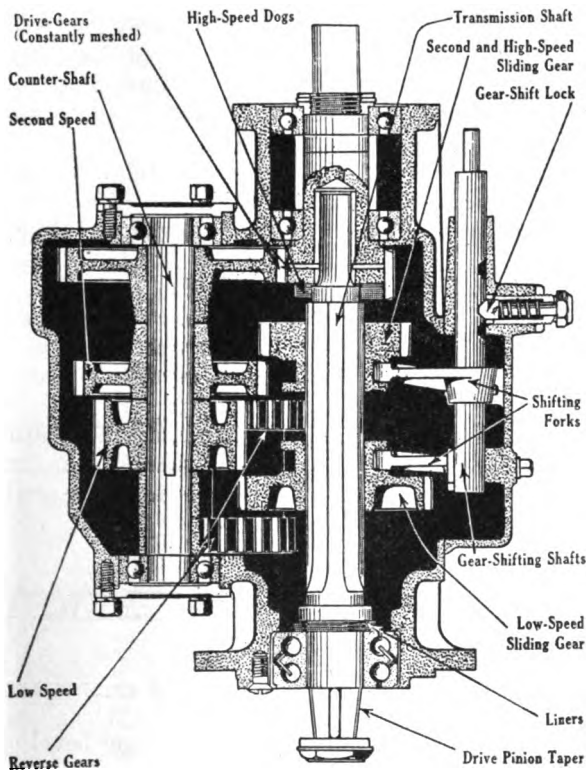


FIG. 3—TRANSMISSION OF OVERLAND MODEL 69—SHOWN IN CROSS SECTION

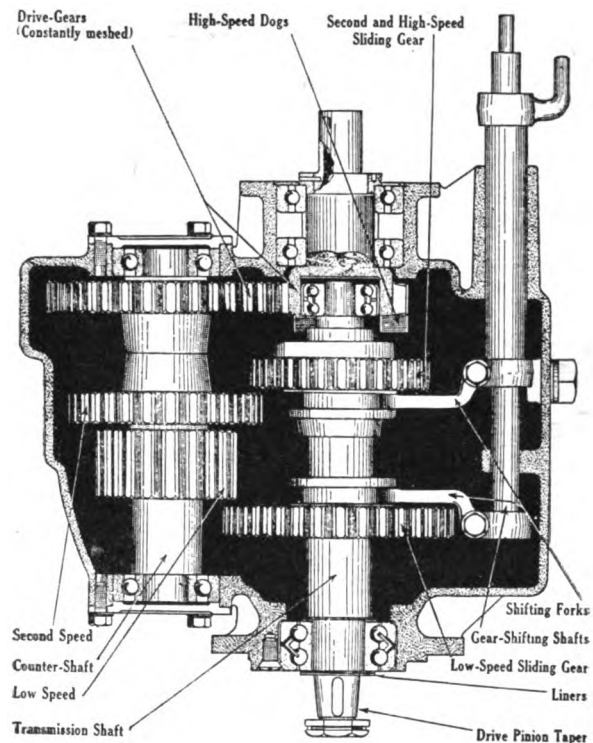


FIG. 4—TRANSMISSION OF OVERLAND MODEL 71 (REVERSE GEARS NOT SHOWN)

and left, because the steering gear is bound to wear most in the center on account of nearly all the car's travel being straight ahead.

After the bushing has been adjusted on several occasions, and the play remains in spite of its adjustment, it will be necessary to remove the ball arm by first removing the clamping bolt C.

Then turn the steering wheel one and a half times around. This will present a new surface (there are four surfaces, as seen in Fig. 2) to the worm. Make adjustment as before, of course replacing the ball arm. Be careful to have everything tight after adjustments have been made.

Transmission

Explained in the simplest way, the selective sliding gear transmission consists of a main shaft from the engine, made in two sections, which

be made to engage with one or another of the various-sized gear wheels on the countershaft, each possible engagement being between gear wheels of sizes differing from those possible in any other combination.

By a movement of the sliding pinion forward, clear to the end of the shaft, three clutch teeth, or dogs, that it bears on its surface can be made to engage with similar ones borne by the other section of the transmission shaft, thus producing the direct drive, in which the power of the motor is no longer transmitted through gears, but direct from the engine to the differential.

The reverse gears are two in number and one of them is always meshed with the low-speed gear on the countershaft. The reverse is obtained by sliding the transmission shaft low-

To keep the transmission in continual good working order and to minimize wear in its parts it is necessary to keep it packed with good gear grease.

Twice a season, at least, the gear box should be opened and filled with gasoline or kerosene and the resulting thin solution drawn off through the opening in the bottom of the gear case. When the case is cleaned, pack with grease, replace the gasket carefully and screw down the cover.

In disassembling the transmission, the transmission shaft goes out first, the countershaft next and the reverse gears last.

In reassembling, care should be taken to secure correct engagement of the differential drive pinion with the large bevel gear of the differential, by transferring, if necessary, some



of the liners from the front to the rear, or vice versa.

Rear Axles

Considered otherwise than in detail, the rear axle consists of a housing which at its center accommodates a set of compensating gears, usually

These roller bearings require no adjustment. Side thrust of the differential is taken up by a ball thrust bearing on either side. Leakage of the differential lubricant through the axle tubes is prevented by a spring-pressed felt washer.

To remove axle shafts, loosen the screws of the differential adjusting collar until the threaded portion of the shaft may be withdrawn through the collar.

To remove differential, withdraw the axle shafts as explained in the preceding paragraph, and remove the roller bearing caps. The differential may now be lifted out.

In reassembling, be careful to mesh the bevel gear correctly and to adjust the ball-thrust bearings properly, though not too tight, against the differential adjustment collars. If necessary, renew the grease-retaining felt washers.

The axle of the full-floating type is one in which the load is carried on the axle housing, upon which also the wheel is fastened, so that the withdrawal of the axle shaft does not disturb the wheel. The differential and the rear wheels run on roller bearings. A heavy felt washer in a stuffing-box keeps all lubricant in the differential case. The stuffing-box cover is prevented from turning by a lock, as shown in the sectional drawing, Fig. 6.

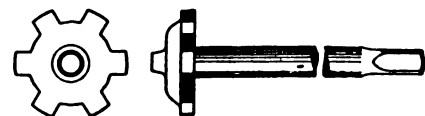


FIG. 7—SHOWING AXLE SHAFT

To adjust the large bevel gear, remove cotter-pins from the differential adjusting collar lock and slide the locking pieces toward the differential. Move both adjusting collars towards the middle of the axle, mesh the gears and turn the adjusting collars back against the tapered driller bearings, being careful to lock them in place.

To remove axle shafts, remove the hub cap and pull out the spidered end which is in one piece with the shaft proper, Fig. 7. The stuffing-box should be opened somewhat to prevent injury to the grease-retaining washer.

To remove differential, remove the hub caps and withdraw the axle shaft as explained in the preceding paragraph; then remove the roller bearing caps, when the differential may be lifted out of its housing. Be careful in properly adjusting the bevel gears and in tightening and locking the stuffing-box.

Adjustment of differential bearings is seldom required. When it has to

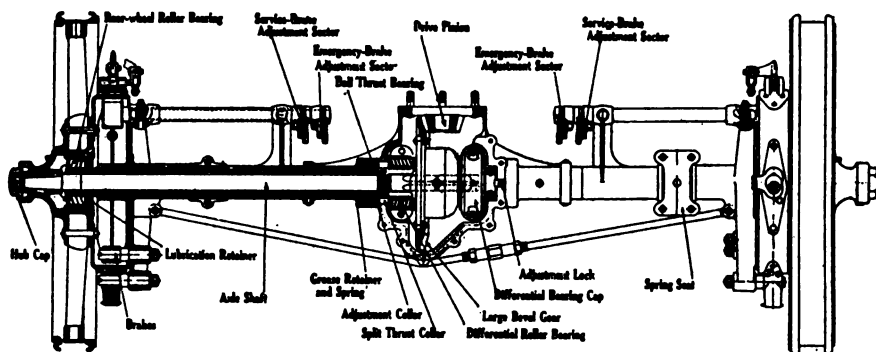


FIG. 5—THREE-QUARTER FLOATING REAR AXLE USED ON OVERLAND MODEL 69

called the differential, and at its outer ends the right and left halves of the divided axle shaft.

The differential gear as applied to automobiles is a device which permits one rear wheel of the car to travel faster than the other, or independent of the other when required.

The necessity for such device becomes more particularly noticeable when the car turns a curve, at which time the wheel on the outside of the curve must cover more ground than the one on the inside.

The three-quarter floating axle is one in which the load is carried entirely on the axle housing; leaving to the rotating axle shafts only the functions of holding in place and turning the rear wheels.

A glance at the illustration, Fig. 5, reveals the construction. The differential is borne on roller bearings, as also are the wheels, which revolve on the double tube formed by the housing and the inner steel tube.

To adjust the large bevel gear is a somewhat delicate operation. When it becomes necessary to adjust the mesh of the large bevel gear and the drive pinion, this is done as follows:

Take the cover from the differential housing. With a screw-driver remove the thrust-bearing adjustment lock on the side toward which the differential is to be moved, and turn the adjusting cup of the thrust bearing in the same direction. Now loosen the two screws which hold the split differential adjusting collar until the collar may be turned in the desired direction. Moving the collar on one side of the differential makes it necessary to adjust the one on the opposite side accordingly; both axle shaft ends having right-hand threads.

When the proper mesh of the gears is obtained, tighten both collars, and follow by bringing the thrust bearings close to the adjusting collars. Be sure to tighten all screws and to replace the small locks which keep the cups from turning.

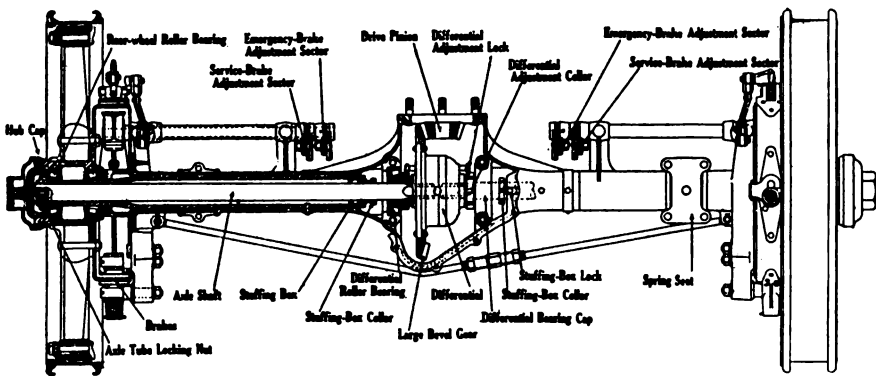


FIG. 6—FULL-FLOATING REAR AXLE USED ON OVERLAND MODEL 71



be made, all that is necessary is to screw the differential bearing adjusting collar against the roller-bearing, care being taken not to have the fit too tight.

Adjustment of rear wheel bearings: Remove the hub cap and pull the axle shaft out until its spider no longer engages with the recesses in the wheel hub and until the rear wheel may be turned without actuating the differential gears. To test the bearing for looseness, rock the wheel. To adjust the bearing, spin the wheel, at the same time drawing the axle tube locking nut so tight as to stop the rotation of the wheel; now loosen the nut just a trifle so that the wheel will turn free upon the axle-tube.

The differential housing should be filled with a good hard grease, and the wheel bearings and hub caps with graphite grease.

Once in six months the differential housing should be washed and cleaned with kerosene or gasoline in the way suggested for cleaning the transmission. It is a good plan to clean and refill transmission and differential housings with grease at the same time.

(To be continued)

Figuring Stock Turn-overs

A. M. BURROUGHS.

A shoe dealer bought ten pairs of shoes at \$2 a pair and sold them at \$3 a pair, costing him \$20 and selling for \$30.00. He turned his capital *once*, at 33 $\frac{1}{3}$ % gross profit on the selling price.

An implement dealer bought a wheelbarrow at \$2 and sold it for \$3. Then he bought and sold another and another and another, until he had sold ten, costing him \$20 and selling for \$30.

He turned his capital *ten times*, at 33 $\frac{1}{3}$ % on the selling price at *each* turn.

The shoe man made 33 $\frac{1}{3}$ % on his investment. The other makes 333 $\frac{1}{3}$ %, gross. The difference is that one man invests \$20 *once*. The other man invests \$2 *ten times*. Both do a gross business of \$30.

If both had \$20 at the start, the implement dealer could have invested his other \$18 in a dozen other items. By the time the shoe dealer had sold his whole ten pairs of shoes

the implement dealer would have sold *ten each* of the other twelve items.

Capital is turned *once* when it is invested in stock and all the stock is sold.

In practice this becomes very complicated, because a part of the capital invested is released almost immediately and put back into additional stock.

This has the apparent effect, on the books, of increasing the investment. The purchase records show stock purchases very much in excess of the capital invested. Sales records

amount of stock on hand and the total amount of the purchase, the retailer can arrive at the number of times he has turned his capital without reference to the amount of the gross business. Whether he has turned it at a profit each time is another matter.

We have purchased \$30,000 worth of goods. Our stock averaged \$5,000. Our original investment was \$5,000.

We have re-invested our money six times. We still have the same

A PRIZE CONTEST

From time to time we receive very clever letters from our friends and subscribers—letters full of original thought—some humorous, some grave, all good, pleasant reading. To encourage clean, clever, original letters of this kind we offer prizes as follows:

FIRST PRIZE - - \$50.00 IN GOLD

SECOND PRIZE - A GOLD WATCH

THIRD PRIZE - - A FOUNTAIN PEN

for the cleverest letter accompanying a subscription remittance of one dollar or more and received during 1913.

The letters may be humorous or grave; they may contain kicks or bouquets; they may be written in rhyme or prose—but they must be clean, clever and original, and accompanying a subscription remittance of one dollar or more.

As an example of the kind of letters we want, the following received from Mr. Tom Roop of Ohio is an exceedingly clever one:

Dear Editor Bernhardt:—

Please find enclosed an unfolded sample sheet of Uncle Sam's paper of recent issue upon which you will observe certain figures and pictures, solid valuable reading matter and no fiction. No claim is herein made that this enclosure in weight or intrinsic value equals your yearly enclosure to me, but it is customary for an orthodox subscriber when he has a \$ about his person for which he can find no present or future use to shy it at the Editor's plethoric purse through the mail or by some other artful agency, and against his vicious practice the hapless Editor seems to have no adequate means of self-defense.

Your sympathetic friend,

TOM ROOP

P. S. I will surprise myself and take out two years', Christmas.

Get your "funny bone," your "bump of cleverness" and your "dome of originality" to working—make a grab for those fifty round little pieces of Uncle Samuel's favorite product. Get busy now, whether your subscription expires now or later—but get busy, then you'll have your letter ready. Remember—cleverness and originality are the deciding points. The judges will be announced later. The contest closes, December 31, 1913.

show, however, that this stock has been sold.

A dry goods man doing \$100,000 business per year on a \$10,000 investment, for instance, probably puts \$60,000 to \$70,000 into stock—that is, re-invests his \$10,000 capital from six to seven times.

Knowing the amount of money originally invested, the average

amount of stock we had in the beginning. So we have invested our capital six times.

The hardware man who has \$10,000 worth of stock when he takes his inventory needs to know the *amount of the purchases* and the average stock on hand to arrive at the number of his turnovers.



When he tries to figure the number of turnovers on the gross business he must allow for the profit on each turn of his capital *before he can know the number of turnovers*. He is working without a starting point.

If he knew the amount of the purchases and the average amount of stock on hand it would be an easy matter to see that he has re-invested the amount represented by his stock a certain number of times.

Suppose you had a gross business of \$10, had stock on hand worth \$1, and knew that you averaged \$1 worth of stock during any given period, how many times would you have turned the stock investment of \$1?

Most smiths would jump to the conclusion that you had turned it ten times.

Now, let's see. Suppose you made 50% gross profit (based on selling price) at each turnover. Fifty per cent of \$10 is \$5, so your total stock investment represented in the \$10 gross business was only \$5.

You turn your capital *once* when you sell all the goods you have bought, regardless of the price at which the goods are sold.

(A chapter from A Better Day's Profits. Copyrighted by Burrough's Adding Machine Company)

Opportunities

Here are listed a number of live opportunities for live blacksmiths—towns and localities where blacksmiths are needed. If you want to start anew and if you have the necessary energy, skill and perseverance to stick to business until business sticks to you, get into touch with these business chances. Unless otherwise stated under the opportunity listed, write to the Commercial Club of the town for full information.

CHANNING, MICHIGAN (Dickinson Co.)

Population 300. This town is the terminus of the Chicago, Milwaukee & St. Paul's Superior Division. The country surrounding is ideal for dairy farming, and iron, copper, and lumber are the chief industries. There is said to be a good opening for a blacksmith shop.

CONATA, SOUTH DAKOTA (Pennington Co.)

This town is located 62 miles east of Rapid City in excellent country. It now has two general stores, a hotel, a lumber yard and an implement store. They need a blacksmith shop.

FARMINGDALE, SOUTH DAKOTA (Pennington Co.)

This town lies in the fertile Rapid Valley and is a thriving business center well represented in most lines. There is, however, a good opening for a good smithshop.

LUDLOW, MISSOURI (Livingston Co.)

Population 700. The town is surrounded with fine farming and stock-raising country. A good garage and general blacksmith are needed.

MOSBY, MISSOURI (Clay Co.)

The population of Mosby is given as 100. It is located in a good corn and stock-raising country and offers a good chance for a good general smith.

BARBER, MONTANA (Meagher Co.)

This is a new town in the Musselshell Valley and is located in an excellent agricultural territory. A blacksmith is needed. Write to Geo. W. Morrow, 1301 Railway Exchange Bldg., of Chicago, Ill., for further particulars.

BUCYRUS, NORTH DAKOTA (Adams Co.)

This town is growing and is located in an excellent farming district. Its prospects are fine. There is a good opening for a good blacksmith.

BUFFALO SPRINGS, NORTH DAKOTA (Bowman Co.)

Between Bowman and Scranton in a rapidly developing section. The soil and climate are excellent. A wagon shop and an implement dealer are wanted. If you can fill both needs, write to the Commercial Club of Buffalo Springs.

CALYPSO, MONTANA (Custer Co.)

A town just building up, surrounded by rich agricultural lands and being settled by homesteaders. There is an opening for a blacksmith. Write to the Industrial Dept., C. M. & St. P. R., 1329 Railway Exchange Bldg., Chicago, Ill.

CARTERVILLE, MONTANA (Rosebud Co.)

Located in Yellowstone Valley, about 32 miles west of Miles City. The town is surrounded by a big tract of irrigated land with another irrigation system in course of construction. There is a good opening for a blacksmith.

CORFU, WASHINGTON (Grant Co.)

A new town with excellent prospects. There is a good opening for a blacksmith and wagon shop. Write to the Industrial Dept., C. M. & St. P. R., Chicago, Ill.

GASCOYNE, NORTH DAKOTA (Bowman Co.)

A new town with a population of 200, growing and thriving in a fine farming country. It now has two grain elevators, two general stores, a bank, an opera house and local and long-distance telephone. There is said to be an opening for a good smith.

JEFFERSON ISLAND, MONT. (Jefferson Co.)

This is a town of 100 population, located in an excellent farming district. There is a good opening for a good blacksmith.

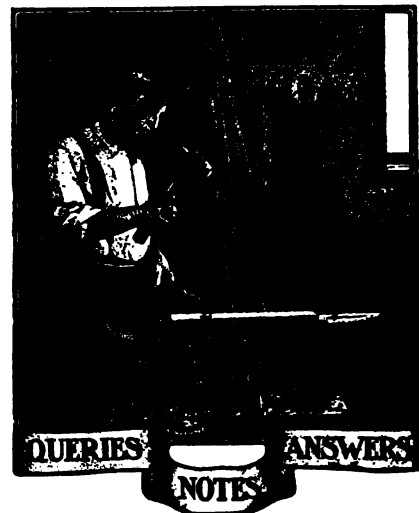
KAISER, NORTH DAKOTA (Morton Co.)

This town is located in an excellent farming section that has been settled by Germans. It now has a general store, a hotel, a barber shop and an elevator. The town wants a blacksmith and an implement dealer.

KITTITAS, WASHINGTON (Kittitas Co.)

This town has a population of 250 and is located in one of the fruit districts of the State. They want a wagon shop.

NOTE—We are indebted to the Industrial Dept. of the C. M. & St. P. Ry. for the above information. Inquiries regarding the above opportunities may be addressed to the department at their Chicago office.



Two Queries.—I have a horse that interferes when going without any shoes. I would like to hear from some brother blacksmith how to shoe him in order to prevent "interfering." Also I would like to know how to hammer a plowshare to keep it from backing. J. E. MAYHEE, Oklahoma.

A Shoeing Query.—Please publish in the next issue of THE AMERICAN BLACKSMITH the following question: How should a horse with a rocking step be shod? That is, a horse that steps on the heel first, and then rocks forward to the toe. What would be the proper remedy for this fault? P. J. EDEL, New York.

The Rule for Setting Axles.—I want to ask through our valuable journal if there is any mathematical rule for setting axles? For instance, by measuring the dish in the wheel and the height of wheel. Say the wheel is 40 inches high with 1/4-inch dish, what drop must be given the point to make the wheel run on plumb spoke. T. J. STEADMAN, Florida.

Steel Plated Shoes.—Take an old horse rasp and cut it up into short pieces with a cupped cleaver. Place the fine side of the rasp on the anvil so as not to injure the coarse side when cutting. Heat the shoe at the toe and have the piece of rasp cold. Lay it on the shoe with rough side to the shoe and give one hard blow with sledge hammer, and it will stick there while you take the welding heat. WM. V. GIST, Tennessee.

Questions on Fires and Rasps.—I would like to know through the columns of THE AMERICAN BLACKSMITH how to build a flue for two fires that will draw the cinders and smoke so that the cinders will not fly all over the shop. I have two fires that I want to use one flue for, and I want to build the flue out of brick. Also, would some brother blacksmith tell me what kind of steel a horse rasp is made from, and where I can purchase the steel? EVERETT BELL, Missouri.

Wants a Plow Bolt Holder.—I would like to know of something which would prevent plow bolts from turning. If the brothers would send in the little labor-saving devices which they have invented and found successful I am quite sure the other brothers would appreciate it. I have made several devices which have appeared in THE AMERICAN BLACKSMITH, and can say they have saved me both time and worry. FRED H. PETTIT, Oklahoma.



Corns and Scotch Shoes.—Will some brother please inform me how oil of cedar is used for corns and how often it should be applied?

Also will someone enlighten me on turning Scotch bottom shoes; as I have to shoe twelve stallions this fall for the fairs, and they all want Scotch shoes. They are all big horses, weighing from 1,700 to 2,300 pounds each. We get \$5.00 per horse for new, machined shoes, and \$7.50 for hand-made shoes.

BERT WINFREY, Oregon.

A Letter from Kentucky.—I don't see how I could get along without "Our Journal." I have been in this one location for 23 years. I do all kinds of work, horse-shoeing especially, and I enjoy reading what the different shoers have to say in "Our Paper." I will take a little time one of these days and tell them something about shoeing; I have been at the business for 30 years. I have a 6 H. P., I. H. C. gas engine and find it A No. 1. I also have a feed grinder and grist mill, and grind one day a week. I also have a combination saw table. This mill business comes in very good in the country. JAS. T. HACKNEY, Kentucky.

A Handy Plow Device.—I am sending you herewith a sketch of a device which I have made to prevent lister shares from drawing together at the heels when sharpening. I took a piece of pipe with a $\frac{5}{8}$ -inch hole in it, about 5 inches long, and plugged one end. I then welded and hammered it down so as to fit the bolt hole. Then I took a piece of $\frac{1}{2}$ -inch rod, 5 inches long, hammered one end of it down so as to fit into the bolt hole. I then cut threads the whole length of it and fitted top on. I put it in end holes, screw top up tight, and the point cannot draw together.

FRED H. PETTIT, Oklahoma.

A Suggestion for Forging Instructors.—As I am the Mechanical Instructor at the Arkansas State Agricultural School I am using THE AMERICAN BLACKSMITH as a text-book. We have about 150 boys in the different classes—something like 75 in woodwork, 50 in forging and 25 in horse-shoeing—and THE AMERICAN BLACKSMITH is the best thing I have found to teach either of these branches; to say nothing of the thousands of other useful things in it. We run our shop with a gasoline engine, and the engine department in "Our Journal" is worth more than twice the amount it costs.

Then the ten questions for the month is one of the best things I ever saw. I can select a number of those from different months and I have my examinations in a nutshell; so you see I can hardly get along without THE AMERICAN BLACKSMITH. The 1912 volume is the finest of them all; I have it bound in book form. Now, I want a number (25 or 50) of the 1912 volumes for the boys to study from. I would also like to hear from other M. E. men and what they think of this idea.

H. T. FINNEY, Arkansas.

Blast Piping, Crumbling Tires, Gas Engine Power, Saw Gumming.—If Mr. Wallace of New York uses power in his 20-inch blower he can put a Y in the air pipe, take one half of it in a separate pipe, run the pipe up the chimney two or three feet and reduce the nozzle about two thirds the size of the pipe, and have the pipe stick straight up in the center of the chimney.

The tire question of Brother F. A. Phillips of South Africa: I have seen tires of the same nature and others that would break in two as though they had been

scarfed for welding. This is usually on steel tires. The crumbled ones are usually iron tires. Let those who have cold tire setters explain their methods to our foreign friend. I think we should endeavor to give all the information we possibly can to our foreign brothers, and in turn they will be willing to give us their ideas and methods.



A HANDY DEVICE FOR THE PLOW REPAIRMAN

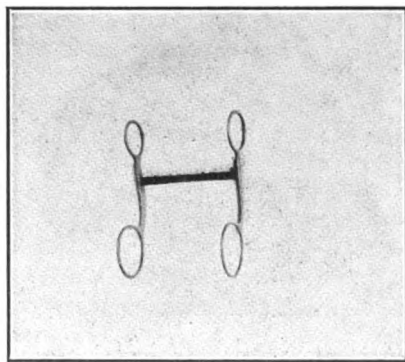
As to the question on gas engines: would say to use a four-cycle engine for steady running and power. I have used an old model, four-cycle engine for thirteen years, but I am going to remodel it very soon. I am going to put a hopper jacket on it, which will make it up to date, and it will be good for thirteen years more.

The saw gumming question: I gum a great many of crosscut and small circle saws, such as mill slab saws, wood saws and lath and shingle saws. I use $\frac{1}{4}$ and $\frac{1}{2}$ -inch thick wheels, 12 inches in diameter, and a wheel that is made for the purpose of saw gumming. When grinding, keep your saw moving from side to side, so it won't heat the saw too much in one place; but you can rush it quite hard after you get it all gummed; slow down your wheel and go over it again and grind slightly on each side.

CHARLES HALL, New York.

Hand-Forged Bits, Fast Shoeing, Engine Repairing.—The accompanying engraving shows one of my bridle bits. I have made several of these bits and get from \$5.00 to \$7.50 each for them, but there isn't much profit in making them at that price, as it takes from ten to twelve hours to make one if you do good work, but I like to do that kind of work when I have time. The bit is forged up solid and hasn't any welds. It takes from 14 to 16 inches of stock from $\frac{1}{4}$ to $\frac{1}{2}$ -inch square to forge from, and any smith can readily see the method of forging them.

I can't help but take a slam at some of those fast horseshoers we read about, and I guess that is about as much as we will ever hear or see of them, as I haven't noticed any of them showing what they could do except on a piece of paper. If



HAND MADE BITS FORGED FROM THE SOLID

they do such fast work they are not horseshoers—they are iron and hoof butchers. I think it takes a man an hour to shoe one horse and do good work, if he calks the shoes up (both heels and toes) and dresses the horse's feet and nails the shoes on.

I have a power-equipped shop and do all kinds of work. I do quite a little repair work on traction and stationary engines, threshing machines and automobiles, and sometimes I have to do quite a lot of repairing in the field, because it is more trouble to get a piece to the shop to repair it than to go and repair it in the field. For instance, last summer a man cracked a piece out of the hub of an 1100 lb. flywheel, and I took an anvil, forge and small tools out to the engine and made two bands, 1 by 4 inches, 14 inches in diameter, and shrunk them to fit the broken hub, and the wheel is still in use. I saved the time that it would have taken to remove the wheel, bring it to the shop and back again. Besides it would have required a great deal of dressing to get the hub to fit the shaft again, as the wheel would turn quite freely on the shaft when it was cracked on account of not having a key in the keyway, and when the bands were shrunk on it was impossible to get it to roll on the shaft with the compression on both engine cylinder and four men turning the wheel over.

HUBERT MCHARDIE, Montana.

A Power Shop of California.—We do everything in our shop from the cleaning of a clock to overhauling an automobile. We have a fully equipped shop, using both electric and gasoline power, and I wish to say here that any blacksmith who is still using hand power to do all of his work is losing the only chance a blacksmith has to make any profit.

With a trip hammer, power drill, band saw, buzz saw, lathe, electric blower and emery wheels, you still have a chance to make a living, but with the hand blower and other hand tools your hands and feet and back get tired; your brain gets tired; your temper becomes uneven; you give some of your customers a piece of your mind, and you lose their trade. Then again, you have to write a nice letter to your supply house, telling them you are very sorry, but you "can't rake up any more money this month."

Put power in your shop, brother blacksmiths, and you will never regret it. Some old fogey will give you lots of free advice and tell you never to go into debt, but if you don't go into debt for your first power machine you will never get one. Get an engine and trip hammer into your shop, and when you start pointing up that heavy plow point that always made you swear whenever you saw it coming you will have a crowd around to see what all the racket is about, and the first thing you know your job is done better than you could do it with a helper, and you won't be covered with perspiration, either.

That crowd is another point; loafers are a bother in every shop, but they do a lot of talking, and that is advertising your business whenever they talk about your new tools.

When you buy a machine, buy a standard make that is well known. Don't buy a machine because it is cheap—cheap tools are expensive at any price; get a machine that is big enough to do your work and a little more.

Also, never buy a machine that you can't make pay for itself inside of three years. Never buy a tool that you cannot keep busy enough to keep the dust off.

J. R. MOREHOUSE, California.

An Interesting Letter from the South.—

There are only three white men in my county doing a general blacksmith business. I am in the heart of the Yazoo, Mississippi Delta—a vast cotton plantation. Each plantation has its own shop and this is run by a negro. There is, however, a good business in general blacksmithing and repair



work aside from plantation work. I have tried to impress it upon my brother smiths in this county to agree upon a uniform scale of prices, but have failed. Any old way and any old price, just so they get the job, is the practice. I have cut out horseshoeing,

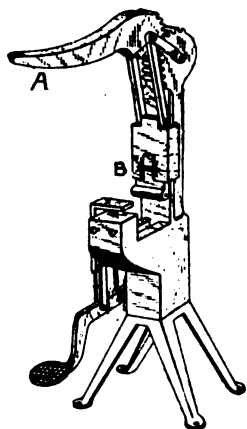


FIG. 1—MR. MILEK'S WELDING MACHINE

as there is nothing in it at fifty to seventy-five cents per pair. There are very few horses to shoe; mostly mules from 2,200 to 2,600 pounds and very vicious. My special line of work is wagon and buggy repairs, and in fact everything that comes under the line of general repairs.

Now a few words regarding hot and cold tire setting. I have been an interested listener on this subject for some time. Some contend that if you don't instal a cold setting machine you are a back number. I will invite those to come down and try my climate and see how they will succeed. I gave one machine a two-years' trial and was convinced. I had to fall back on the hot process, owing to the fact that the climate is too damp. It is necessary to remove the tire from the wheel in order to get rid of the scale which forms between the tire and felloe. To set the tire will of course crush the scale, and the pounding on the hard road when dry (that is the only time tires in this country need setting) will sift out and in a few days the tire is gone and the poor blacksmith gets the blame. Now I am not condemning the cold process. It is O. K. in its climate, but down here where I am located—we are only 172 feet above the sea level and at least twenty miles to the nearest hill—I invite any doubting Thomas to come down and try his hand. I admit there is more money in it for the repairman than the hot process, but the customer is the one who suffers. I set tires here by the hot process in the dry season and they remain set until the next dry season. Now, can anyone do better with the cold process? R. T. DALE, Mississippi.

Welding Plow Shares.—Noticing the constant inquiries in your paper about welding plow shares, and especially the reply of Brother Lassel in your October number, I will offer a description of my present method of welding plow shares, which, through the assistance of a small machine that I have made, is far ahead of anything that I have ever heard of or ever seen.

The method of Brother Lassel is the one that I used years ago and up to the time that I made my machine. His plan is a very good one, but open to several objections. In the first place, the clamp often becomes heated and expands enough to allow the lay to spring away from the landside point, thus causing much trouble to

weld, and in the second place, three or more heats are required even when the clamp does hold.

My present method, learned after years of experience and effort to overcome the common difficulties of the blacksmith, is to first fit the landside point so as to be $\frac{1}{8}$ of an inch lower than the plow landside, and fit the bevel same as the slope of the plow. Drop the landside point slightly in, so when the share is welded, the point will go out by sharpening. Second, fit the blank lay down on the share braces evenly and in line with the landside, then, with a cold chisel, mark on landside point how far the share goes up on landside point. Then heat the share at the point and bend over the landside point so that the share will fit evenly with the chisel mark on the landside point.

Now take a special pair of plow tongs, as shown in Fig. 2, and grasp the share at the heel of the point, place in the fire, heat the point, weld at point and drop on plow to fit. If the landside has slipped, a few blows from the hammer will drive the share down on the plow and give a perfect fit. Now place the share in the fire, give one good even heat, drop onto the table on the machine in Fig. 1 and with one downward pressure on the lever, marked A in the drawing, a special plow hammer fastened at B in the movable sleeve will engage the whole point and make a complete, perfect weld with one heat and as rapidly as one can move his arms.

F. W. MILEK, South Dakota.

More Welding Troubles.—I am in trouble again. I cut down some old wagon wheels and had to cut pieces out of the tires to make them small enough. On the first tire, I tried welding by lapping ends without scarfing as some one recommended in THE AMERICAN BLACKSMITH. I welded it, but it wasn't a smooth job. The next one refused to weld; I tried borax and salt, mixed, also welding plates and a welding compound. The tire seemed at a good heat. I could see the fluid run and maybe it would stick or seem to, and afterward come apart. I cleaned out the forge, took the pipes out and cleaned them and put on fresh coal. I cut off the ends I had been working on, and welded in a piece, using the welding compound—somebody's or some kind of a "toe calk" compound, I

have. I have also mixed some salt and borax when having similar trouble and used some of this on the tires. What effect would this have?

This morning, to test my fire which gives off sulphur gas, I tried welding a piece of iron (an old header bull wheel spoke) onto a piece that I think was mild steel, with borax only, and both welds were good. I then tried to weld two disc pins (shaft steel I suppose) without anything, without borax and by using a compound—they wouldn't stick either way.

Can you tell me what may be wrong and what to do?

SANDFORD E. FRAZELL, Nebraska.

In Reply.—From the description given by your reader of the troubles he is experiencing I should judge that he is attempting to "stick" his welds together with welding compound. There is no "glueing" ability in borax or anything else used in welding iron or steel. The office of all welding compounds is to exclude the air from the surfaces to be welded and thus prevent oxidation and the formation of scale. If too much borax or compound is used it may in itself prevent the welding of the metals. Then, again, imperfect contact of the surfaces to be joined will prevent welding. Improper scarfs will allow some of the flux to remain in the weld and will also allow impurities to remain in the joint. It is also necessary that the flux or compound be properly applied, covering the entire surface to be joined, but not to such an extent as to make contact of the two surfaces impossible.

Naturally, the old tire after pounding over the rocks and roads for 45 years must have undergone some changes in its structure. But whether or not those changes would make any difference in the weld ability of the metal is a question. It would appear, however, that this old iron would be more easily welded; though in some instances old iron contains many impurities and is, therefore, brittle, "short", and hard to weld.

Salt and sal soda thrown in the fire are of questionable value. Some contend that salt will purify and clean a dirty fire, but this seems to me to savor very much of the magician's "hokus-pokus." The best way to have a clean fire is to use clean coal. Good smithing coal that can be relied upon may

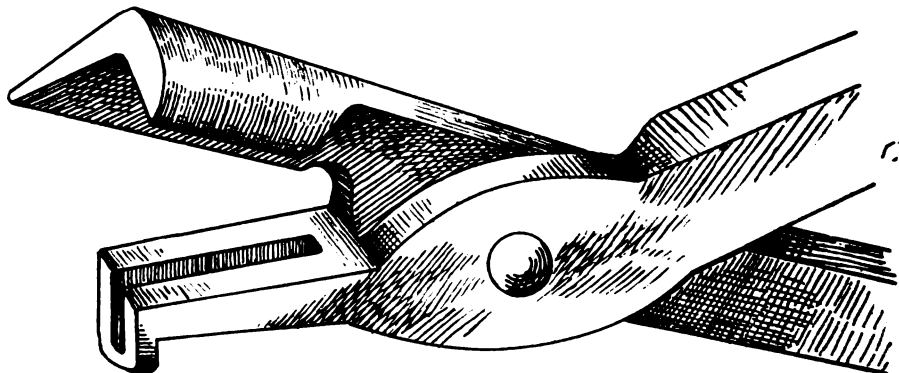


FIG. 2—A SPECIAL PAIR OF PLOW TONGS TO GRASP THE SHARE AT THE HEEL

think it was called. (I would like to know, as I wish to try some more of it.) The third and fourth acted like the others, in fact more so, and I haven't got them done yet and hardly know what to do.

Is a tire that is very old (I think one of these is 46 years old), or crystalized, any harder to weld than new iron? Will an iron tire crystalize? I also burned salt and sal soda in the fire, as I had read of doing this. Please explain what effect this would

cost more, but it is worth more than ordinary coal.

To summarize—I would suggest that your readers consider and study each job of welding as a job by itself. Consider the exact nature of the metal, the proper welding heat for that particular metal and then heat and work accordingly. Don't try to weld the steels and the various grades of iron at the same heat.

L. H. K., New York.



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Why We Can Afford It

One of our good friends over in Ohio, after accepting our chart offer as announced on page 40 in the May paper, and examining the charts and the book on steel wrote:

"How can you afford to do it? The charts and book are worth the price at which they are marked—and then some. And the charts with 'Our Journal' make a winning combination—but—how can you do it?"

This is why we can afford it—In order to put a lot of subscription business through just before the summer dullness we make it worth something to you to renew now. But the expense could not be met by single-year subscriptions; therefore the necessity of requiring a two-year renewal in order to get a chart, free.

Then, too, we saw the usefulness, the practical nature and the practical value of these charts, and determined to make some arrangement with the owners of the copyrights whereby we could distribute them and place them within the reach of every craftsman. And while we felt that the charts were fully worth the price placed upon them, there are many smiths who would not know the value of the charts until they examined them.

Finally, it is worth something to us to have you subscribe for two years, and that's why we make it worth something to you.

Now, a word as to those charts. The chart of The Horse is the same well-known chart advertised for several months by the American Chart Company. It is exactly the same chart they sell for one dollar each.

Toy's Chart and Treatise on Steel is a hand-colored tempering and hardening chart, with a 42-page book on steel and general work. Mr. Toy has had 40 years' experience in the trade; and his chart and book tell some of the things he has learned. The chart, alone, is worth the price to any practical steel worker.

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This Issue

The leading article in this number of "Our Journal" tells how a box of cards, a book and an ordinary file serve as the book-keeping system in a general shop; and not in an easy-going, hit-or-miss fashion, as a reading of Mr. Bowden's article will show. The system explained by Mr. Bowden is extremely simple, free from complications and obviates the necessity of doing twice what can be done once just as efficiently. if done correctly the first time.

Not very much attention has been paid to bookkeeping and accounting, for blacksmith shops. There is not very much material, no books and few examples from which to work; so we have found it necessary to search out good working models, to get in touch with smiths who have worked out systems of their own, and request them to describe their methods for our columns. These articles will be published from time to time; with an occasional issue featuring business and bookkeeping systems.

If you are using a sound, practical accounting system, let us know about it. Give us the details, a few sample forms, and we'll see that "Our Readers" understand.

Your Back Copies

Are you preserving your back copies? We have a very convenient binder that will keep your copies clean and untorn. The binder is just the right size to hold a year's issue or volume of "Our Journal"; with the advertising pages. The binder is strongly made, is very neat and each binder bears the words "THE AMERICAN BLACKSMITH" in gold on the front cover.

This binder is furnished our readers at 80 cents each, postage prepaid. Just try one to hold the present volume;—you can add the copies to the binder as they come to you, and when the volume is finished you place the bound book in your library.

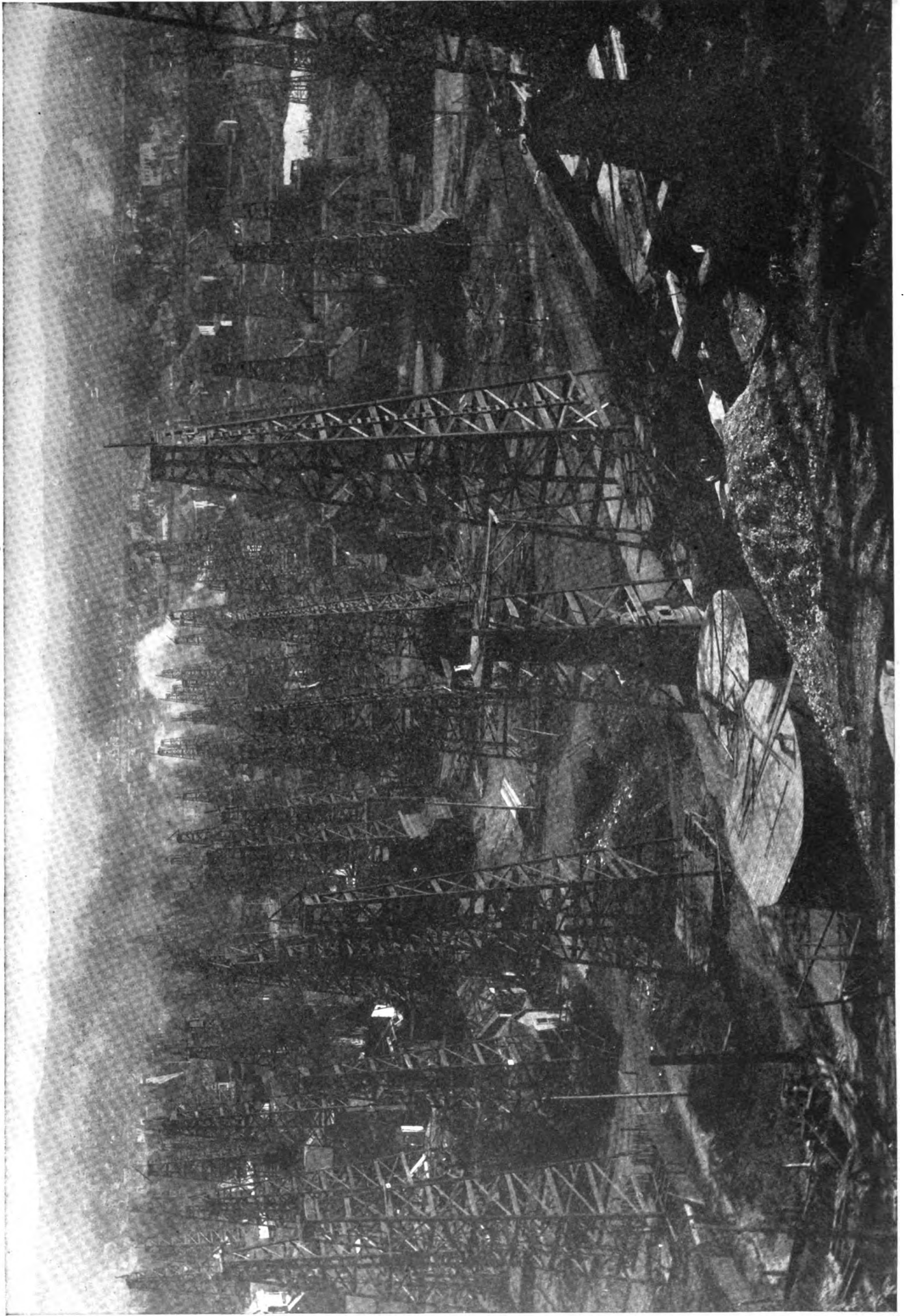
The Next Two Numbers

Next month, July, will find our shop number with us again; and it will be a veritable treat for the shop-owning smith; with its page after page of shop pictures, its descriptions of equipments, its shop-made machines and its almost endless list of shop hints and kinks.

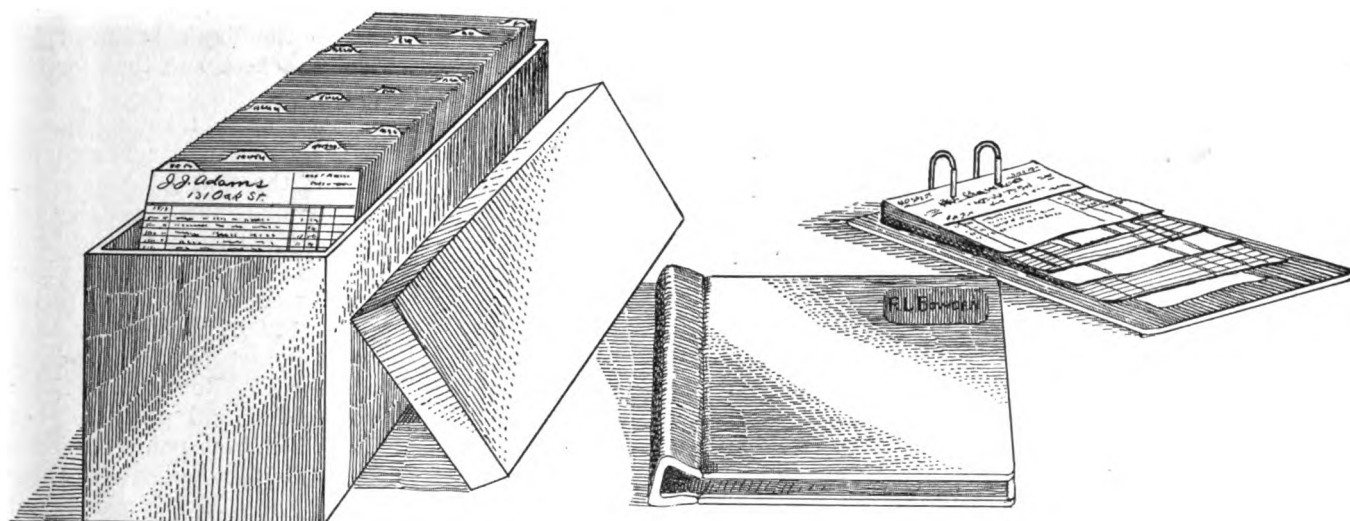
And the August issue will be another big feature number. The eyes of the entire world are now focused on the Panama Canal which is now rapidly nearing completion. It is the biggest, most stupendous collection of engineering feats that have ever been attempted by man. And—all the great things done down there have not been accomplished without the aid of the blacksmith. In August we are going to tell about the Panama Canal, and we'll have something to say about the smith's part in the building of the Big Ditch.

Subscription Agents

When a stranger solicits your subscription to THE AMERICAN BLACKSMITH, or any other publication, insist upon his showing you absolute proof that he is an agent in good standing and is employed by the publication which he represents. Don't, under any circumstances, give the man your money if you are not sure that he really works for the paper he says he does. No matter what the man offers you—no matter what price he makes—no matter what premium he promises to send—DON'T GIVE HIM YOUR MONEY IF YOU ARE NOT SURE.



THE CALIFORNIA OIL COUNTRY—A WELL OCCUPIED SECTION NEAR LOS ANGELES



A Card System of Accounting, For A General Shop

RALPH J. BOWDEN

THE system which we are using in our business now is the result of dissatisfaction and a general dislike for the usual long-drawn-out and complicated methods of bookkeeping. The practice of sitting up evenings with the books never appealed to us; and after some years of it we determined to install a simple system that would tell us all we needed and wanted to know and would not require our sitting up half the night after a busy day in the shop. We think we have the system, and as it has stood the test we know that it is far ahead of the old method.

The Equipment

Our equipment consists of one card index tray, to hold the 5 by 8-inch cards; one book, made on the loose-leaf order, and one wire arch file for bills payable. The cards contain all credit entries, all stock records and serve as day book, cash book, ledger and all. The book is a business diary—a summary, day by day, of business transactions. Both the book and the diary are written up once, and once only—that is when the need for writing appears. For example: Bill Jones comes in to have his horse shod, and as he pays cash we simply make an entry in

the diary on the page for that date, and that is all there is to that transaction, no writing in a day book, then transferring to the cash book or to the ledger when a credit transaction, and in the case of credit—one entry is made in the file, on the customer's card.

The Card

The card used is just as simple as the equipment. On the customer's card all we need and want is his name, his address and the entries for the work you do for him. Then, in the space for entries, should be a column for the dates, the description of work and the debits and credits. Upon the customer's card the work is charged for when it is finished. No entry is made in a day book with the necessity of transferring it to the card. Entering the charges directly on the card does away with the posting and other evening work on the books.

For keeping track of jobbers' accounts, the same form of card is used. The name of the house is placed in the proper space with the address. In the space at the right may be placed memoranda regarding any special inducements, discounts or other propositions made

by the firm and, in the regular entry spaces, the dates of the bills as they are received, the number of the bill (all bills are numbered and kept in numerical order) and, lastly, the amount of the bill. If the bill is for one item, such as "Shoes" or "Plow Lays," this is written in the proper space. But, if it is a bill of mixed goods, the abbreviation "Mdse." is entered, and the number of the bill then follows.

For keeping tabs on expenses, the same form of card is used. "Expense Account" being written in the proper space at the top and then the items of cash-outlay and business expense are entered as they are paid. It is, of course, understood that freight and express charges are not entered as expense items, but added to the cost of the goods. The items entered under "expense" are rent, salaries, water, insurance, telephone, lighting, heating, etc.; anything that enters into your cost of doing business and not directly chargeable to stock or goods.

The Bill File

The file for bills payable is simply an ordinary double-arch affair in which bills are numbered and filed as they are received. Of course an



entry is made for each bill under the proper index-card account before filing. In this way we keep our bills so they can be easily and quickly found; and the index-card for each jobber shows just what we owe,

they are filed away; a string being passed through each hole at the top to hold them securely and to keep them in proper order.

The Business Diary

This book keeps us posted on the

each day it is a very simple matter to foot up the day's business, get totals for the week and then for the month.

For example, to take a page at random: we find under March fifteenth that the first job was a set of four new shoes for Jim Haley for cash, at \$1.80. Then Mr. Jones' son came in with a broken gear wheel which we brazed and charged to his account at \$2.00. A stranger then had one shoe reset for 25 cents, cash. Salesman for The Rocker Iron Store Company called and presented bill of \$5.20, which was paid. Ordered goods according to duplicate of order in order folder. Mr. Harlow paid his bill of \$18.20 and ordered a set of whipple trees for his old wagon. Will Cummings brought buggy for repairing; promised for Saturday. Otto Reimen purchased pail of axle grease for \$1.00, cash. Mr. Barton paid bill of \$2.00. A stranger with automobile asked for help in fixing car and repairing tire. Received \$1.00 for job. In summarizing the day's business just before closing the shop and going home we find that \$24.25 cash was taken in, while \$5.20 was paid out and \$2.00 was on credit. This memorandum is put down at the bottom of the page; and at the end of the week it is a very simple matter to add up each amount to find out how much cash you should have, how much credit business you have done and how much money you have paid out. The totals for the month and year are then equally easy.

How It Works

Some will no doubt say that a blacksmith is often too busy to make an entry in the card index at the time when the work is done. He may be busy, in fact, extremely busy, but if he is any kind of a business smith, if he is not in business for love (and we know of few, if any, smiths who are) he will not be too busy to take care of his business. And entering the records properly, promptly and correctly is just as important as if not more so than doing the work properly.

After we had installed the card-index system it was so new and we were so well pleased with it that we never forgot to enter a charge or a memo. for anything; and that business diary has saved us many a dollar; and many a dispute with a

[illegible]

THE CUSTOMER'S CARD SHOWING THE SIMPLICITY WITH WHICH AN ACCOUNT IS KEPT

what we have paid and the balance
can be figured in a moment.

The bills are kept in the file until the file is full or there are too many to handle conveniently. Then the paid-bills at the bottom are taken out. When one hundred bills, consecutively numbered, have been paid,

work done day by day, so that we can tell just how much business we are doing. We tried at first to make the card index do for this daily record, but find it more convenient to enter the daily records in a book. This book is on the loose-leaf order, and as at least one page is devoted to



customer has been satisfactorily settled by referring to our carefully kept diary.

There are, of course, details to this system that we have not explained; but those we have purposely avoided, because they must necessarily be worked out to meet the special needs of the business. As far as the card-index system is concerned it works very satisfactorily for a small or medium-sized general blacksmith business; and it can, no doubt, be enlarged for a business of practically any size.

The equipment, I believe, can be secured from any of the many houses selling business requirements. One of the jobbers I deal with told me

inches long. The book to serve as a diary carried sheets 5 by 8 inches. These sheets are held in place by metal posts, the sheets being perforated, and used sheets can be taken out at any time and filed. The double-arch bill-file needs no explanation.

Educating a Competitor

There are some men to whom a small shop that brings a fair interest on the small capital invested and living wages to the proprietor means a big success. There are other men who look upon such a proposition as a near failure. Joe Harris was one of the others.

with the added burden of carrying all the risks of his business, carrying all the worries, and he is at the mercy of general business conditions, seasonal dullness and his own physical health. And to cap it all if he doesn't grow he stagnates, and to stagnate means to perish."

In this last, Joe was certainly correct, for given any business—manufacturing, merchandising or any line—there is constant and regular improvement in them all. Of course there is more improvement in some than in others, but there is improvement. If any one man in any line intends to stand still—if he doesn't grow—he must go under. It may come about gradually, but it is

[illegible]

THE JOBBER'S CARD IS KEPT IN THE SAME BOX

[illegible]

THE EXPENSE CARDS ARE PLACED AFTER A GUIDE

where to get what I wanted, for none of the equipment is of odd size. The card index is furnished just as I have described it. The cards are 5 by 8 and the case to hold them is about 5½ by 9½ and about 12

Joe explained his thoughts on the subject as follows: "A small business does not take the proprietor far enough away from the position of helper. The owner of the small shop is merely an overworked employee.

nevertheless sure that he will perish. The trade moves on, but he stands still, and in standing still he appears to go backward.

And so Harris gradually built up a business on the theory of "grow

Everything was not "roses and honey", by any means. Joe Harris had troubles and lots of them; but to the man who is determined to win and to succeed, real troubles are but temporary obstacles on the road to success. Harris' biggest trouble was, as is often the case, right in his own mind. And his brain seemed to work overtime on the problem of competition. Not that he feared any of the other smiths in the town, for he was on friendly terms with all of them, but his constant dread was that some outsider would come in and spoil his dream of success.

Following right upon the heels of his attempt to hire Joe's men, Mr. Competitor flooded the town and surrounding countries with big circulars announcing his coming. In these he dilated upon his experience, his equipment, and emphasized particularly his price-reductions.

Harris had always been careful in his business transactions, had always pushed his business hard, but, while he kept careful tabs on his accounts, his records as to profits, costs and similar matters had no real existence. Joe's determination to carry the fight right into the enemy's camp caused him to open his eyes when it came to the profit question and the matter of cutting closer to costs. In other words, Joe discovered that he knew absolutely nothing about real costs and real profits. He *thought* he made a good profit on shoeing—but he didn't *know*—he *thought* he made a profit on painting—but he didn't *know*—he *thought* he turned over his stock often enough—but he didn't *know*—so he determined to find out.

He dug up his records, his old bills, his books of account. From them he got costs and selling prices. He figured on overhead expenses and what it cost him to do business. He analyzed his business from one end to the other. He figured on realities, not suppositions. He considered facts, not fancies. He used records, not guesses. And after days of digging and nights of figuring he found that for every single dollar's worth of work done in his shop, just exactly twenty-three cents must go toward overhead expenses. He found that 23% of the money received from every single job must go toward meeting the actual expense of doing business. He found that what he supposed was a percentage of profit on many jobs was a percentage of loss. He found that although shoeing may cost him \$1.35 per set, there was no profit, but sometimes an actual loss, at \$1.50 for the selling price. He found that sharpening was done at a loss for a dollar.

So he went from item to item and through account after account; and after the rearranging of prices, after proper adjustment of expenses, costs

[illegible]

THE BUSINESS DIARY TELLS A REAL LIVE STORY

Joe Harris had not the least bit of yellow in his make-up. He was not given to brooding over imaginings, but this dread of outside competition was one thing he could not shake off. With every monthly increase in his business, with every new customer, with every new advertising stunt, his dread grew stronger, until he began to wonder what sort of a chap this outside competitor was going to be. He got to picturing this fellow in his mind, wondering how he would start his attack. "Will he be a botch or a first-class general smith? Of course he will flood my customers with circulars, boast of his expertness and will cut prices to the bone."

Thus did Joe Harris work and worry; he never lost sight of his objective—his idea, his goal—but neither could he lose his thought of the outside competitor.

And he became real one day—this imagined outsider. He became one

Price-cutting is dangerous; it is like poisoning the water supply of the enemy in real warfare. You intend it as a blow to your enemy, but it may hit back and disable you both. In an attempt to analyze the exact situation, Harris tried to divine whether his rival was making real reductions or featuring reductions in some work and bolstering his losses with corresponding advances on other lines. He found, however, that Mr. Competitor was out for his scalp. Price-reductions were real, and it didn't take Joe's customers long to find it out. Several who had brought their work to Joe's shop for years, came in manfully to talk the matter over. They all admitted liking Harris and also his treatment of them. "But", said they "we can't be blamed for taking advantage of reduced prices. You do that yourself or you are not a good business man."



and selling prices he determined to work at a profit, competition or no competition.

The end of this story is perhaps best told in Joe Harris' own way: "While digging and figuring I had no time nor chance to watch my competitor and to see what he was doing. When I finished the work, my sigh of relief was cut short by the old dread of uncertainty as to what my competitor was doing and what he was going to do next. I knew now what it cost me to do business; I knew what I must charge for my work in order to make a profit, but I also knew that my competitor didn't know those things about his business. I felt sure that he was charging for his work on the basis of imaginary profits. If this was a fact his finish was postponed only just so long as his resources held out. How long that was to be I could not tell and I didn't propose to wait. My problem was how to get him to realize that he was "in wrong" as far as profits and prices went; and considering our relationship you must admit that this was a real problem. I tackled it, however, with the idea that unless I solved it the years of hard work and the entire foundation upon which I was to build a still larger business would be worth nothing at all as far as my chances were concerned. I therefore hit upon the following plan: I prepared a series of profit and price circulars; these were all aimed at my competitor. In these circulars I frankly told just what I had discovered in my analysis of my business. In one circular, for example, I told frankly just exactly a smith's position in the business world; how the smith is absolutely necessary to the well being of the community. In another I told about my service to the community and the cost of it. In another circular I spoke of costs, in another of profits and in still another of selling prices. So I kept at it, hammering continually along the line of prices and profits, service and selling price. My original idea was to get my competitor to realize that he either knew nothing about the business end of blacksmithing or that his figures on expenses, costs and profits were far too low. But my campaign did neither of these things—it merely demonstrated my ability as a real business smith; and after several visits to a lawyer

it resulted in a partnership; for my competitor gradually worked 'round to speaking, and finally suggested our going in double harness. I knew he was a good workman, and why should I not take this chance to build up a business and make it bigger than I alone could do?"

Legal Difference Between a Promissory Note and a Judgment Note

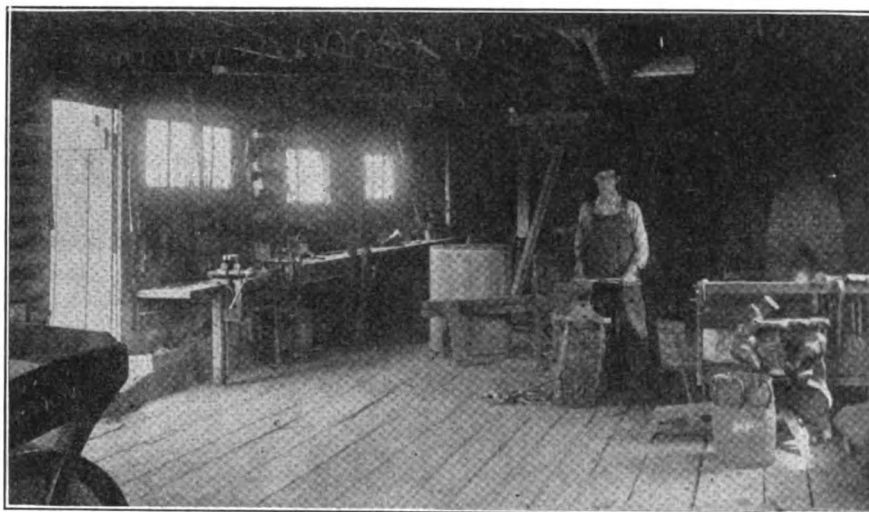
I have been asked verbally, by a reader who expresses a friendly interest in these articles, to discuss the difference between a judgment note and an ordinary promissory note; with the particular object of making it clear why it is better for a creditor to take a judgment note

for me and after one or more declarations filed, confess judgment against me as of any term for the above sum with Costs of suit and Attorney's commission of five per cent for collection and release of all errors, and without stay of execution and inquisition and extension upon levy on real estate is hereby waived, and condemnation agreed to and the exemption of personal property from levy and sale on any execution hereon, is also hereby expressly waived, and no benefit of exemption be claimed under and by virtue of any exemption law now in force or which may be hereafter passed.

Witness my hand and seal.

WILLIAM SMITH (Seal)

The promissory note is a mere promise to pay a certain sum at a certain time to a certain person. If it is not paid when due, the payee (party in whose favor the note is drawn) is practically where he was when he started—he still must bring suit to recover the debt. As a matter of fact, in such a case the accepting of the note has actually delayed him, provided it was in payment of a debt which was due when the note was



THE GENERAL SHOP OF MR. W. H. MYERS OF PENNSYLVANIA

in payment of a debt, or as security for a debt, than to take a promissory note.

Here is the ordinary form of a promissory note:—

\$100.00

PHILADELPHIA, PA., November 15, 1912.

Sixty days after date I promise to pay to the order of John Jones, One Hundred Dollars. Payable at the First National Bank without defalcation. Value received.

WILLIAM SMITH.

No.

This is the usual form for a judgment note:—

\$100.00

PHILADELPHIA, PA., November 15, 1912.

At sight I promise to pay to the order of John Jones, One Hundred Dollars without defalcation, value received, with interest.

And further, I do hereby empower any Attorney of any Court of Record within the United States or elsewhere, to appear

given. It would have been quicker to bring suit on the debt itself, rather than on the note.

When he starts in to sue on the note he must go about it exactly as he would have done had there been no note, and as if he had sued on the debt. The note is not of the least advantage to him, except in this way, that when he comes to prove his case in court he will need only to offer the note in evidence. If he was suing on the debt, and not on the note, he would have to offer much more evidence—evidence that would prove the entire claim; a much more arduous task than simply offering the note in evidence, and resting.



Of course, a note also has this advantage—it is a written admission of the debt.

The remedy of a man who accepts a judgment note in payment of or security for a debt is much quicker and easier. As I have explained, a promissory note must be sued on before judgment can be obtained. With a judgment note no suit is necessary—the note itself includes a confession of judgment. All that is needed is to take the note when due to the Clerk of the Court, and he will enter judgment on it and file it. The suit which is necessary with the promissory note is entirely avoided with the judgment note, and this of course escapes the chance that the suit might not be successful.

All judgment notes contain what is called a warrant of attorney. That is the language in the above form beginning, "And further, I do hereby empower." With this in his hand any attorney, or any layman for that matter, can go into any court and be granted judgment for the amount of the note.

Another advantage is the clause binding the maker of the note to pay 5 per cent cost of collection. The attorney for the payee is usually willing to accept this in full for his services if the note is for a good-sized sum, so that the legal proceedings cost the payee nothing, which is as it should be.

A third advantage in a judgment note is that the maker agrees not to appeal anything that may be done. This often saves months and even years. The maker of an ordinary promissory note who is being sued upon it is under no such restrictions, and can appeal and delay as much as the law will let him.

A fourth advantage about a judgment note is the waiver of exemption which it always contains. This prevents the maker from claiming the benefit of the exemption laws of his State, and is often the means of getting a debt paid which would otherwise not be paid at all. A promissory note contains no waiver of exemption; and even if judgment is obtained upon it the debtor may claim exemption and escape payment after all.

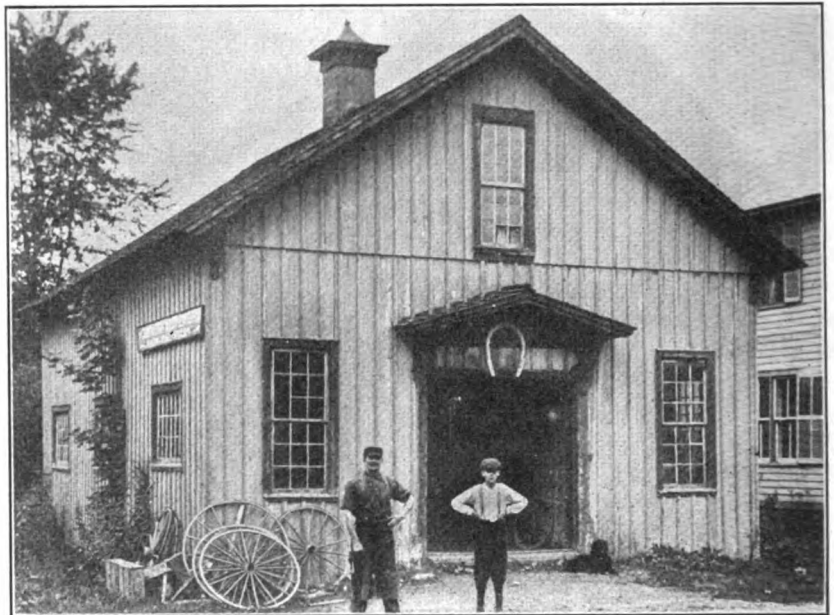
A judgment note can be made payable at any time, just like a promissory note, but it is always

best to have it made payable at sight, for then it can be entered up at once and the lien of the judgment attaches from that date. The Clerk of the Court will not give you judgment on a judgment note until it is due.

Another vital difference between a promissory note and a judgment note is that under the courts of all States a promissory note is freely negotiable and can be discounted or sold. As to whether a judgment note is negotiable, the courts differ, some saying that it is and others saying the contrary. The Pennsylvania courts rule against the negotiability of a judgment note, for example, while the Ohio courts rule in favor of negotiability. This difference is rather against the availability

you would receive if renting or leasing it to others.

- 3—Charge in addition to what you pay for hired help an amount equal to what your services would be worth to others; also treat in like manner the services of any member of your family employed in the business not on the regular pay roll.
- 4—Charge depreciation on all goods carried over on which you may have to make a less price because of change in style, damage, or any other cause.
- 5—Charge depreciation on buildings, tools, fixtures, or anything else suffering from age or wear and tear.
- 6—Charge amounts donated or subscriptions paid.
- 7—Charge all fixed expenses, such as taxes, insurance, water, lights, fuel, etc.
- 8—Charge all incidental expenses, such as drayage, postage, office supplies, livery or expenses of horses and wagons, telegrams and telephones, advertising, canvassing, etc.
- 9—Charge losses of every character, including goods stolen or sent out and not charged, allowance made customers, bad debts, etc.



THE WELL-EQUIPPED POWER SHOP OF WILLIAMS & CORTIS IN NEW YORK STATE

of a judgment note as a quick asset, but it has so many advantages that they far outweigh this disadvantage, which as pointed out is a disadvantage only in some States. The creditor who is about to take a note as security for a debt, or in payment of it, should invariably get a judgment note if he can.

(Copyright by Elton J. Buckley)

These rules for figuring costs and profits are recommended by the National Association of Credit Men

- 1—Charge interest on the net amount of your total investment at the beginning of your business year, exclusive of real estate.
- 2—Charge rental on all real estate or buildings owned by you and used in your business at a rate equal to that which

10—Charge collection expense.

11—Charge any other expense not enumerated above.

The Purpose of the Inventory

A clerk in a retail dry-goods store sold half a dozen items to a customer for cash. As he was wrapping up the order he slipped ten yards of silk into the package.

When he rang up the sale on the cash register it did not include the ten yards of silk.

The cash register didn't yell "murder," and there was no record of the silk removed from stock.



When the owner of the store counted his cash at night he found in his cash register just the amount which the tape showed should be there.

He thought his clerks were all honest. He never suspected anything to the contrary. Yet this one clerk was as crooked as the negro porter's kinky hair.

At least a dozen of the customers of the store always insisted upon being waited on by this one clerk. Apparently it was friendship and good salesmanship. In reality, in this case, it was—something else.

These customers, apparently among the best customers of the store, came in almost every day. The amount of goods they took away unpaid for and uncharged, however, much more than ate up the profit on the goods for which they paid.

At the end of the year an inventory was taken. But the method of taking inventory in this store wasn't designed to uncover crookedness. It was only designed to give the owner of the store a rough *estimate* of the amount of goods on hand.

The inventory was not checked against the sales or purchases. No stock record was kept.

About three years after this clerk was employed the owner of the store decided that he should have a better bookkeeping system.

Within a month after the complete system was put in operation the crookedness of the clerk was discovered. The loss was estimated at \$5,000 a year through the dishonesty of this one clerk.

The merchant now takes an inventory four times a year and keeps a stock record which enables him to check his inventories against the stock he should have on hand. It protects him and his clerks.

His purchase record shows him the exact amount of stock bought of each line and of each division in each line—shirts of different sizes, for instance. When goods are sent from the stock room into the store, the amount is recorded in the stock book.

At the end of three months, when the goods in the store are inventoried, the amount on hand in the store and in the stock room must balance with the stock as shown on the stock record.

His new bookkeeping system departmentizes his store in such a way that if any particular line of goods was short he could at once trace the shortage to the clerk who was in charge of that department.

A druggist in a little Pennsylvania town, who had never taken an inventory in the ten years he had been in business, got pinched for money and decided to check up his stock in the hope of raising money by a clean up sale.

He found \$15,000 worth more goods on his shelves than he thought he had.

He thought he was carrying about \$10,000 worth of stock. In reality, he was carrying \$25,000 worth. He had kept no records that enabled him to know how much he had purchased, how much goods he had sold or the amount of profits he had made.

If his store had burned out before taking his inventory he would have been satisfied with \$10,000 from the insurance companies. He would not

With an accurate system he was soon able to reduce the amount of stock he carried and to make a great deal more money.

The amount of capital released by the up-to-date methods enabled him to meet his bills and open another store. Now he conducts half a dozen stores.

An inventory without a stock record affords no check against the goods which *should* show in the inventory. A stock record without an inventory affords no check against the theft of goods from stock.

The inventory is to the stock record what the counting of cash is to the cash register.

Running along from year to year without knowing what stock you have on hand is no more business-like than going along from day to day without knowing what money is in the cash drawer.

Are you only *guessing* at the amount of stock *you* have on hand?



Apologies to Power

GOOD RAW MATERIAL—A HINT ON SOLVING THE APPRENTICE PROBLEM

have known that he was figuring himself out of \$15,000.

After he took his inventory he was so astonished at what he found that he decided to put in a system which would enable him to know exactly where he stood all the time.

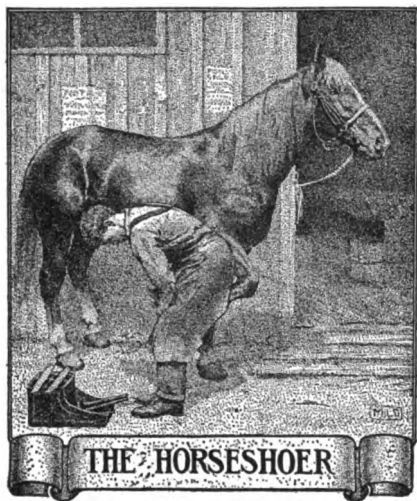
Is *your* inventory only an *estimate* of the amount of goods you *should* have?

Can you honestly say that you are able to make as much money out of your business without really *knowing* all there is to know about it as



you could make out of it if you *did* have the information at your finger's ends? Be honest with yourself; apply these principles to your own business.

A chapter from A Better Day's Profits Copyrighted by Burrough's Adding Machine Company.



Three Common Diseases Affecting the Horse's Foot—2

H. C. WILKIE, F. R. C. V. S.

Sand-Crack

A sand-crack is a cleft or fissure in the hoof, beginning at the coronet and extending downwards frequently the whole length of the wall.

This condition must be carefully differentiated from cracks in the horn, which arise from the ground-surface and extend upward, but do not involve the coronary band which runs around the upper part of the hoof and manufactures the largest part of the wall.

Cases of sand-crack are very common in some parts of Otago, and they are frequently a source of much trouble to horse-owners, and considerable depreciation in the value of horses.

Causes

A dry condition of the horn may be stated generally as the principal predisposing cause of sand-crack, as rendering that structure more brittle and liable to crack on violent concussion, as in jumping on to a hard road, fast trotting, etc. After this, the opening and closing of the fissure causes sufficient irritation of the coronary band to keep up the mischief.

Another common cause of sand-crack is a tread or injury to the coronet, where sufficient damage is done to interfere with its proper

function—that of secreting horn. With a brittle hoof, such an injury will cause a sand-crack, while where the horn is in a naturally elastic condition it will not crack so readily, but may remain intact until the local inflammation has subsided.

The sudden evaporation of water from the horn, which takes place when a horse is brought in from a moist pasture to a hot stable with a hard, dry floor, renders the horn extremely brittle and liable to crack from very slight causes. Many bad sand-cracks commence in this way.

Symptoms

A sand-crack is frequently at first a very slight crack in the hoof. Lameness is present in severe cases which have been produced suddenly, or in cases which were slowly produced and have been in existence some time. The lameness is due to the pain produced by pinching of the sensitive laminae of the foot by the crack as it opens and shuts when the foot receives or has removed from it the weight of the body. This is, in cases where the crack is much open, aggravated by an inflammatory condition of the sensitive laminae which is produced by the entrance of particles of dirt, etc.

Horses suffering from sand-cracks have been frequently sold as sound, by fraudulent persons to unwary purchasers, by means of a variety of different devices which have been adopted to destroy all appearance of the crack. The sand-crack is usually filled up with tar, wax, putty, or guttapercha, and the horse is shown with plenty of mud on his feet. Any one purchasing horses in the rough without seeing the feet, properly, runs a considerable risk of buying experience dearly, as many have done before.

Treatment

With regard to the treatment of this affection, the first thing to be done is to arrest all movement of the edges of the crack. If the crack is well open and any dirt has got in, this must be removed before anything else is done, and the whole crack washed out with an antiseptic. The edges of the crack must be brought together and fixed immovably, and to effect this many methods are adopted, but the most effectual of them is the Vachette clasp. These clasps are small, narrow bands of steel, and are very strong. A little

notch is made on each side of the crack, usually with an iron (the horn should not be burned deeply), and the clasp is closed over the crack with a pair of forceps specially made for the purpose. I usually put in as many clasps as there is room for on the foot, as the great essential of treatment is absolute cessation of movement in the crack. A blister is usually then put on the coronet over the crack in order to stimulate the healthy secretion of horn.

In most cases this treatment is effectual, but there are some very severe ones which cannot be treated so, as where the crack is very wide and the edges cannot be brought together. Such cases are curable by an operation, which consists in destroying all chance of further pinching and irritation by the removal of a large V-shaped piece of horn, of which the point is downwards. This operation has to be performed under a general anesthetic, and the wound is afterwards treated with antiseptic dressings. New horn after this operation grows very rapidly, and in most cases it is good sound horn without any appearance of the sand-crack.

The shoeing of a foot affected with sand-crack requires some special attention. The shoe, in these cases, should be light, and in the case of a toe crack should have two clips, one on either side of the crack, but a little distance from it. The shoe must have a good solid bearing on the wall of the foot, but under the crack the horn should be cut out in a semi-circular fashion in order to remove all weight-bearing from this part.

It is absolutely essential to the successful treatment of sand-crack that the horn should be kept in a moist and elastic condition. From what I have said, previously, you will remember that the horn-tubes are open on the under-surface of the wall, the bars, the frog, and the sole, and it is here where that absorption of water takes place which will remedy the brittle condition of the horn. This portion of the hoof then requires to be kept moist constantly in cases under treatment for sand-crack.

Navicular Disease

Navicular disease is an inflammation of the navicular region, which commences sometimes in the tendon-sheath (navicular sheath) and some-



times in the bone itself, which in many cases becomes carious.

It is a disease more especially of the fore feet, and of light horses; draught horses being seldom affected. It is more commonly seen in harness-horses than in hunters, or horses used entirely for the saddle.

It is less common in this colony than in the older countries, but I have seen many cases of it here, and it is a disease which is of considerable importance to all horse-owners.

The navicular bone derives its name from its peculiar shape, which is somewhat that of a boat. "Navicula" is the Latin term for a boat or small ship, from *navis*, a ship. This little bone is contained within the hoof, and articulates with the coffin-bone on the one hand, and the coronal bone or bone of the coronet on the other. It presents a smooth surface for the great flexor tendon of the foot to play over, it supports a little tendon-sheath (the navicular sheath, which is lubricated with a fluid analogous to joint-oil), and by its position it gives strength and solidity to the last joint of the limb without impeding, but rather favouring, free movement.

The navicular bone is held in its place by powerful ligaments, some of the most important of which are covered by cartilage which is an extension of the cartilage on the posterior face of the bone. This fact is of great importance in enabling us to understand some of the phenomena of navicular disease, because it shows how any severe strain or injury to these ligaments may react upon the cartilage covering the bone and so upon the bone itself.

Symptoms

In the earlier stages of navicular disease there is, as a rule, but little lameness, the first indication of its presence being that the horse "points" the affected foot—that is, he extends it in front of him while standing. This pointing is altogether different from that which we see in some horses which have nothing the matter with them, except fatigue, or that tired feeling without work which affects some horses, as well as men, occasionally. In this case a fore and a hind limb of opposite sides are rested and bent, but in navicular disease only the affected fore foot or feet are "pointed." The knee is kept rigid, and the heel rests upon the ground.

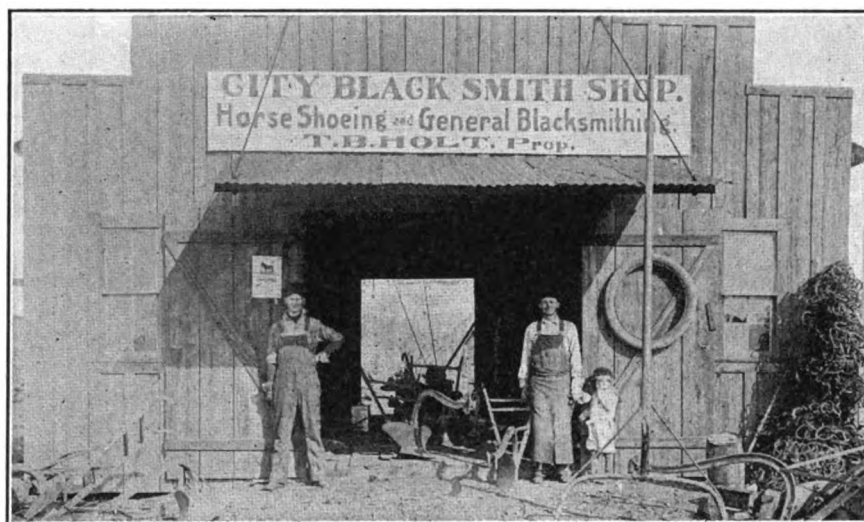
Similar pointing to this also occurs in pain from corns, sidebones, splints, etc. After a time, lameness is manifested, usually coming on for a few minutes and going off again during work. As the disease progresses, the lameness lasts longer and longer, until the patient is lame all one day and sound the next, then lame for a week at a time; and at last he becomes lame, constantly.

The lameness of navicular disease sometimes first manifests itself (al-

As you will notice, there is no one positive symptom of navicular disease, but to those accustomed to deal with it, the action of the horse is of the greatest importance in the earlier stages and, in the later, the action together with the changes in the conformation of the hoof.

Causes

The causes of navicular disease are of two kinds, predisposing and exciting.



A GENERAL SMITH SHOP OF OKLAHOMA RUN BY MR. T. B. HOLT

though the disease has been in progress for some time) after shoeing, the jar inseparable from the ordinary nailing-on of a shoe having determined it. In such cases the shoeing-smith sometimes gets the blame of having lamed the horse.

In the lameness of navicular disease, the affected foot comes to the ground after a very short step with the toe first, and as this part of the foot cannot by itself bear weight for any time, and the heel is too tender to do so, the weight is very quickly taken off the limb altogether.

After navicular disease has been in existence for some time, certain changes take place in the conformation of the hoof, which consist mainly in the foot becoming more upright and blocky, the heels and frog contract, and the sole goes up and becomes more concave than it normally should be. The hoof is usually dry and hard. There is often some heat about the heels, especially after work, and in some cases pain is manifested on pressure in the hollow of the heel.

The *predisposing causes* are either hereditary or acquired.

The *hereditary taint*, which is indicated by a small, narrow, hard frog, abnormal dryness of horn, high heels, narrow, upright feet, and a small plantar cushion, is well-known as a thing to be avoided by all experienced breeders of horses.

An *acquired predisposition* is brought about by bad shoeing or the unnaturally dry condition of the horn, which is induced by continued standing on hard stable-floors. The principal faults of shoeing which induce such a contraction of the foot as predisposes it to navicular disease are the continuous cutting-away of the frog and bars, weakening of the sole, "cleaning out" the heels, and the confining of the bearing surfaces to the wall only.

The principal exciting cause of navicular disease is the concussion to which the feet are subjected in over-fast or continued work on hard roads. Such concussion is very likely to determine the disease where any of the predisposing causes are present.



The necessity for absorption of water by the under-surface of the wall, the frog, the bars, and the sole, is very great in healthy feet, but especially so in such as are predisposed to navicular disease.

Treatment

This disease is only curable in the early stages; as when the bone is carious on the tendon-sheath is obliterated we can hardly, from the inaccessible position of the bone, expect to do much good. Cases must be treated according to the condition at the time; but so far as general principles are concerned, the wall of the heels usually requires to be shortened considerably, and the feet kept constantly wet, either by standing in cold water or by placing the horse in a damp meadow.

A blister around the coronet is frequently useful.

In the more advanced stages of the disease, when it has become incurable, in certain cases the best treatment is bisection of the plantar nerve. After this operation, as there is no sense of pain in the foot, there is no lameness, and in many cases horses are made serviceable for a year or two, or even longer, by means of it. The operation can only be performed in specially suitable cases, because where the navicular bone is carious, or the great flexor tendon is adherent to the posterior face of the bone, as it sometimes is, the horse being relieved of all pain in the foot puts full weight upon it, both in standing and in action, and is liable in the one case to fracture the bone, and in the other to break down the tendon. This operation, which is sometimes called "unnerving," is, however, of great service in its proper place, and by its means very many horses have been restored to usefulness for a considerable time.

Two Simple Devices for the Pipe Worker

R. C. HORSFALL

The accompanying engraving is a bit of studied economy from our scrap heap. This device is more serviceable than a Stillson if the jaw is properly tempered. Take a fourteen inch file, split at the end about one inch down, and make the sides as shown in engraving. For ten cents you can get about "two quarts" of old cycle chain, one-half or five-

eighths pitch preferred, and you will find it a good all around tool when properly made. I made one of these ten years ago, when I was an apprentice eighteen years old, and I still have it in daily use when any pipe work comes along, and I usually have some pipe work every day.

To use it, pass the chain around the object and hook it at A. The jaw, B, is made like an alligator wrench, full length of jaw.

Another useful tool in the form of an alligator wrench jaw is to fit on an ordinary wrench and to convert into a pipe wrench. The illustration at X shows the device plainly and without need of explanation.

Cashing In On Foresight

A general smith in a growing Indiana town had been in business just three years. He had built up a fair business, but it was nothing wonderful. The work done at his shop ranged from shoeing, through wood-working and vehicle work and included auto repairing. Beside this he carried a number of side lines which were in charge of a young chap whose business experience previous to his connection with Jim Walton's smith-shop had been gained in selling afternoon papers. But the young fellow whom we will call Joe for convenience had the make-up of a modern business man, as we will presently see.

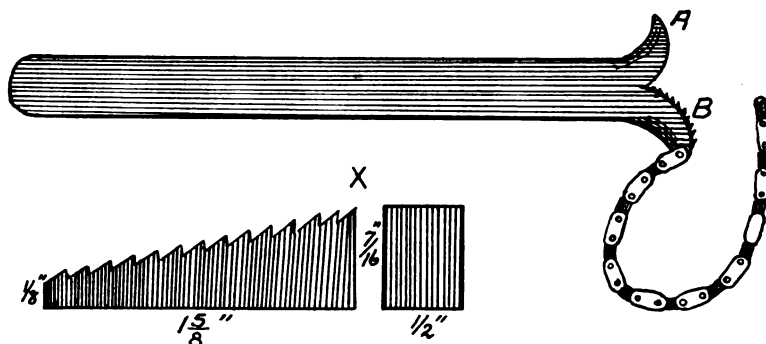
about the few implements which Jim Walton kept on hand.

One day while waiting for a horse Joe surprised Walton with the question: "Say, Mr. Walton, don't you want somebody to demonstrate these implements for you and sell them?"

Walton didn't think he did and he told Joe so. But Joe was unconvinced. Joe thought Walton needed somebody, and furthermore he thought he, himself, was the proper body for the job.

But several days of talking on Joe's part had no effect, until finally he presented this proposition:

"Look here, Mr. Walton, you have a growing business, are kept pretty busy in the shop and can't devote the time you should to your side-lines. There is not enough trade in them now to make the lines worth very much, so you cannot sell out that part of your business. I am looking into the future. I want some day to own a business of my own, but at the present rate of progress I will be seventy before I have enough capital. You have the capital; you have already invested several hundreds in side-lines that can be developed if they are pushed. I can push them. I am now averaging about four dollars and thirty cents a week—if you will pay me four and a half a week, put me in charge of selling the side-lines, I will build up that end of your business until it will be profitable to you and to me, also."



TWO SIMPLE DEVICES FOR THE PIPE WORKER

Joe's salary was very small, in fact it was so small that he called the job an opportunity, and he made the opportunity himself. This is how it happened:

Joe, beside selling afternoon papers, ran errands for several merchants about the town. He took horses to Walton's shop on several occasions, and while waiting for them Joe usually busied himself by nosing

Of course, Walton accepted the proposition, and Joe started in. First he cleaned up all the stock, scraped the dust and soot from the pails of axle grease, dug the dirt out of the currycombs, brushes and wagonjacks and washed up the few implements in stock.

Then he kept his eyes wide open; he read the papers carefully and observed the wagons and teams that



came to the shop. When he read that Tom Jones or Farmer Brown was building additions to house or barn he immediately camped on their trail with a paint catalog and color book. When on such calls he observed broken implements or the lack of implements he also talked business. Sometimes he got it, sometimes he didn't. But he impressed it upon every man he called on that he was out after business every minute; and naturally he got a considerable quantity of it. You know when a man goes after anything and goes after it right he usually gets it; and so it was with Joe—he went after business, and it wasn't long before he was taking care of considerable trade.

Thus things went on for several months, when the entire town was worked up over the prospect of a big factory locating in the "burg." Others thought of it as a great thing for the town—and so did Joe; with the added thought that he could make it a big thing for himself, too.

He got in touch with the builders of the new hundred-thousand-dollar factory and found out what some of the materials were for the buildings. He found that a certain brand of roofing was to be used; a well-known brand of cement in the concrete construction; an excellent make of gas engine was to be installed in certain parts of the plant where only intermittent power was necessary; and so he determined just what makes and brands in lines he could handle were to be used.

He then got in touch with the makers of these goods; secured the agency and also secured a considerable amount of advertising for each product just at a time when it would bear with telling effect.

For example: when the walls of the factory were going up and when scores of workmen were pouring bag after bag of cement into waiting forms he told the manufacturer of the cement to place his ads in the local papers; and Joe, himself, put out a big sign, announcing that his store was the agency for that particular cement.

In like manner, when everybody in the town was talking about the roof being placed on the plant, Joe told the roofing manufacturer, and at the same time stacked up a big pile of the roofing in his side-line

store. He changed the cement sign for one advertising that roofing.

Of course it didn't take Joe long to get an increase in salary, and it wasn't long, either, before a partnership was tendered him.

Today—well, Joe studied, developed and kept right on looking ahead and cashing in on foresight. He applied his methods to all departments of the shop, and you may judge that Jim Walton and Joe in double harness are a winning team.



The Editor Talks on Credit and How to Establish It

"Credit is simply the expectation of money within a certain limited time," said the Editor in reply to Benton's query. Then continuing, he said, "It is simply the fulfillment of a promise to pay for something you have already received, at a certain date. And, paradoxical as it may seem, the time to establish credit is when you don't want it."

"How do you explain that?" questioned Benton, trying to draw the Editor into a discussion.

"It's just like this," began the Editor. "Suppose you are in business, you buy your goods from manufacturers and jobbers; and doing a good business you make a point of discounting your bills regularly and promptly and are considered an ideal customer by all from whom you buy. Now, let us suppose some big deal comes along for which you need ready money and in which deal your money will be worth more than in discounting your bills. Just so sure as night follows day will your manufacturers and jobbers start a-gossiping and remarking about your strange unexplainable failure to discount your bills; and the very fact that you were so ideal in this respect will be the means of destroying your credit. While you, on the other hand, were beginning to think that because you were paying promptly each and every month you could get just about anything and everything you wanted from any house. Again I say, the time to establish credit is when you do not want it—then you'll have it when you need it."

"Your illustration of the discounting of bills and how it will actually injure a man's credit when he needs it most is very clear," agreed Benton. "But still I can't see the point of your remark about establishing

credit when you don't need it. How would you establish a credit if you were in business?" And Benton sat back in his chair and blew smoke rings while the Editor explained his idea.

"In the first place," began the Editor, "credit is worth something; so if it is going to cost anything to establish credit we shouldn't hesitate about paying a reasonable cost. Now, let us suppose we are in business. We are able regularly to pay and to discount our bills, but we don't. Every once in a while we take full time and sometimes a little over. Of course we pay in the end and we lose the discount, but we are establishing credit. Then one day we both hustle over to our bank to have a note discounted—we don't need the money, but we do need the credit, so we can afford to become offended if the bank refuses and we can afford to take our account down the street to the other bank. Of course the interest on the note is something, but so is the credit that we are trying to establish. And anything that is worth anything is worth paying for. So we pay our note promptly when due and charge the interest to the cost of establishing credit. It simply works out the same as in the little loans made in personal affairs of men. You meet Jones on the street or at lodge and he borrows a five-spot. The next morning you receive his check by mail. And the next time he wants to borrow do you refuse him? Do you think any less of him because he borrowed that five and paid it promptly? So, I say, if you don't need credit, so much the better and so much easier to establish it so you will get it when you do need it."

"That is so," agreed Benton. "I have often thought of the fact that the chap who is considered 'good, but a little slow' usually gets more favors, better service and greater credit than the fellow who pays promptly and discounts his bill. I think you have hit the situation about right. The fellow who—"

But Jim Braker burst into the room, interrupting Benton, and appearing very much excited.

"Just the chap I want to see," said Jim. "I've got a job over to the plant that has got to be done by tomorrow night. We got a couple dozen small parts to some chap's machine in the annealing room and I've got to get them to the machinist's tomorrow morning. It's now 4:30—how am I going to anneal them all without working all night?" And Jim wiped the beads of perspiration from his forehead.

"That's easy," said Benton. "You just take a piece of gas pipe—about three-inch will do—and close up one end of it good and tight. Then clean out your forge and build a good, clean charcoal fire; place your parts to be annealed in the pipe and place the pipe in the fire. Now heat up carefully until the pieces are cherry red—you can see this easily by looking into the open end of the pipe which should, of course, protrude from the fire. Now cover the fire with sawdust and leave it for the night."

"That sounds good, Benton, and I'll follow your instructions to the letter." And with a hearty "thank you," Braker went back to his work to try out Benton's latest hint.

The Blacksmith and the Tailor

SUGGESTED BY A RECENT STORY TOLD BY
MR. W. F. WENDT
W. O. B.

In a quiet German village,
In the midst of Swaben land,
Once there lived a brawny blacksmith
Who with sinewy arm and hand,
Here amidst the happy peasants,
By the Danube's waters blue,
Long had labored at his anvil;
Labored as all Teutons do.

But a fever came upon him—
On this smith so true and strong,
In the typhoid's grip he struggled,
'Till all hope of life was gone.
The old doctor's face grew sadder,
As each day he anxiously
Saw his friend, the smith, grow weaker—
He knew what the end must be.

Long he sat, this man of healing,
Long he thought of his good friend,
Now upon his death-bed dying
He no skill nor aid could lend.
Then he spoke: "My friend, my brother,
Is there not some last request?
Can I not some favor grant you,
Ere you're laid to final rest?"

Said the smith, with face contorted,
Every feature filled with pain—
"I am dying—death is creeping—
I will never strike again.
So this last request—I pray you—
Do not fail me—do not doubt,
For I soon will get the Summons—
"Give me, then, some sauerkraut."

The old doctor never faltered,
For he knew the smith must die,
So he brought the dish requested,
Served him all that he could buy.
Stranger things have seldom happened—
Days of miracles have not fled
Soon the smith was strong and better—
Soon he left his ailing bed.

Long the man of healing marveled,
Then declared: "That kraut was sure
Just the thing for typhoid fever,
Now I have a certain cure.
I will not forget the healing
That it did for brother smith.
He is now as strong as ever
"Stead of in a grave of death."

Shortly after, the old doctor
Sought the tailor of the town,
"Come right over," said a neighbor,
"For the tailor's sick and down."
Soon the doctor saw that fever
Was the tailor's trouble, sad,
And that typhoid had developed,
Making matters worse than bad.

Then the good old man of healing
Remembered well his sovereign cure,
He kraut gave the dying tailor,
Feeling that a cure was sure.
Stranger things have seldom happened—
As we stated once before—
Soon the tailor out of danger
Had passed on through death's dark door.

Long he sat, this man of healing,
Thought of life and how to save;
Of the blacksmith, strong and healthy,
And the tailor in his grave.
Then he wrote into his diary,
Wrote it as 'tis best he should,
"Sauerkraut is fine for blacksmiths,
But for tailors not so good."



Pure water is a good thing to quench other things besides heated iron.

Price alone doesn't indicate whether an article or machine is cheap or expensive.

If a man is a chronic kicker should he call at the farrier's when he needs shoes?

Perhaps it's necessary sometimes to change one's mind in order to show that one really has a mind.

Cuff Brasher says: "Sum chaps I see about town have not only seized opportunity, but they've choked it."

Remember—don't keep your engine batteries right up close to your engine where they will get hot. Keep 'em cool—they'll last longer.

Just as iron determines the quality of the steel made from it, so the boy indicates the quality of the future man. Take good care of the boy.

The time to establish credit is when you do not want nor need it. Then you will have it when it will perhaps form the wall between success and failure.

It is interesting always to know what other people think of you, but most important is what you think of yourself. Ever get to thinking along that line?

Whenever you find a lazy, good-enuff-for-me sort of a chap who allows the old tires, wheels and what-not to accumulate about his shop, you'll find a price-cutter. At least that's been our experience and observation.

How times have changed and men with them. Noah let the contract for the ark when he was a young chap of six hundred summers. Now-days, when a youngster gets along toward the sixtieth milestone, he talks about retiring.

"If you add side lines, build them up one line at a time by using idle money," says Thornton. "If you build that way, you grow. If you build on borrowed money you multiply your chances of failure, because you are conducting several different businesses under one name.

Friend Tardy fared worse than usual the other day. Of the three jobs brought into his shop, he said, "can't be done" to every one; and of the six jobs that went past his shop to Brown's, "five of 'em was easy money," said Tardy in telling us about it.

'Tis said that the Town of Walcott in a prosperous German farming district of Iowa, while having a population of but 100 homes boasts of 77 automobiles. Are you still waiting before taking up automobile work? Are you still hesitating and allowing some expert (?) to capture the auto business while you hesitate?

Your letter can secure that fifty dollars just as quickly as any one's. And then, too, there are other prizes. Get your funny bone to working and your bump of originality may be the one to capture the first prize. But don't put this off. Read the conditions of the prize contest in this issue and then get busy.

Unless we make good,
As we can and should,
We ought to go back
to the woods;
For the fellow who stays,
In these modern days,
Is the chap who
delivers the goods.

For nearly fifty years previous to 1910, the advances in the price of gasoline were about one mill per annum per gallon. In 1912 the retail price advanced 75%; and since January, 1913, there has been a steady advance—Pennsylvania crude oil advancing seven cents a day on each of three successive days in January. Where will it end?

What are you putting aside for the rainy day? No matter how little, nor how much, do put something away for the rainy day. It's not so much the amount as it is the persistent saving of a certain sum. Octave Girard of Ware, Mass., retired well off at the age of seventy-two, and during a lifetime of manual labor never received more than a dollar a day. He says, "The secret of saving money is steadfastness of purpose and steady work. Liquor has caused more poverty than any other cause. I have seen men stand up at a bar and spend in a minute or two all the money they could earn in two or three days."

It's a crucial moment in a colt's education when you start him to work; and the same thing is true of the human animal. Right at this point, in the life of both boys and colts, it is possible to make or mar the future value and usefulness of the man and colt. Often the colt is forced to work beyond its physical endurance—and being fagged out it refuses to go farther. In many instances the whip is applied, and a balking horse is the result. Balkers are made, not born. Colts and boys need careful, intelligent handling to make useful, valuable horses and men. The good horse is worth every bit of the time and care spent to make him good, and the good man is worth more. A scrub horse or man isn't worth much as values go these days.

While we are sorting our stock—separating the "A-1" material from the "second's"—while we are placing the "100 per cent critter" upon the pedestal of idealism—while we are planting our "prize crop" in anticipation of the "fall show"—while we are picking the "pride of the flock" for the "prize pen", let us not forget the boys and girls. Let us not forget them while we are getting "our entry into form." Let us not forget that of all the "stock," of all the "crops," of all the "products," the boys and girls are the most valuable. If a thousand dollar horse is worth all the time and trouble devoted to its care, isn't a twelve hundred dollar boy or girl worth time and trouble, too? Just give the matter a little careful thought, folks. You may at first glance consider this matter a little out of our line, but you won't after you think about it.



Our Honor Roll

Get Into the 1923 Class

A five-dollar bill will do it—will place you right up near the front—at the head of the column. Send in your remittance today. If your subscription expires with this issue, a "five" will pay you up to June, 1923, and you'll save as much as you spend. Do it now and save money. Don't wait! Get into the 1923 class today.

	U. S. and Mexico	Canada	Other Countries
Two years.....	\$1.60	\$2.00	10 shillings
Three years.....	2.00	2.70	14 shillings
Four years.....	2.50	3.20	18 shillings
Five years.....	3.00	3.75	1 pound
Ten years.....	5.00	7.00	1 pound 14s.

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W. C. WATT, Kan.	Dec., 1930	GLEASON BROS., La.	Jan., 1918
I. J. STITES, N. J.	Jan., 1928	C. E. KRUG, Wis.	Jan., 1918
W. R. TURNER, Man.	Oct., 1923	G. E. WOODARD, Kan.	Jan., 1918
W. SCHOONOVER, Pa.	Apr., 1923	P. J. DALLY, W. Aus.	Jan., 1918
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T. BRADLEY, N. S. Wales	Mar., 1923	F. PROCTER, Tas.	Dec., 1917
I. T. NEDHAM, Ill.	Feb., 1923	J. G. JOHNSON, Ill.	Dec., 1917
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P. FREDERICKSON, Iowa	Nov., 1922	G. J. SAUER, Mo.	Dec., 1917
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A. D. STANDFORD, Wash.	Sept., 1922	E. M. WURSTER, Mich.	Nov., 1917
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G. HOFFMAN, N. Y.	July, 1922	W. T. CUTKOMP, Iowa	Oct., 1917
J. ERMAN, Ark.	July, 1922	J. DELAUS, Neb.	Oct., 1917
W. K. W. HANSEN, Pa.	June, 1922	GEO. POTSCHEK, Mo.	Oct., 1917
ROBERT TOCHTER, Cal.	June, 1922	J. W. RAPS, N. Y.	Oct., 1917
J. VAN MARTER, N. Y.	June, 1922	W. C. RONEY, Pa.	Oct., 1917
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LOUISA CARRIAGE WKS., Va.	May, 1922	W. A. WILSON, N. Z.	Sept., 1917
S. SMITH, Tex.	Apr., 1922	R. ROSS, N. S. Wales	Sept., 1917
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THEO. PASCHKE, Neb.	Apr., 1919	V. J. HUBBARD, N. Y.	July, 1917
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ROBERT COOK, Ky.	Sept., 1918	F. C. BOCK, Neb.	June, 1917
A. B. WENDLANDT, Wash.	Sept., 1918	P. VANDERHEAGEN, Mich.	May, 1917
A. J. BROOKMAN & Co., Vic.	Sept., 1918	YOST & HALVORSON, Minn.	May, 1917
PETER COCKS, W. Aus.	Sept., 1918	W. MCCOY, Kan.	May, 1917
R. J. TOMPKINS, Tex.	Sept., 1918	A. GUNTTLER, Tex.	May, 1917
A. DISCHER, Aus.	Aug., 1918	C. F. J. LORENE, N. Y.	May, 1917
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ALBERT MELLUM, N. D.	June, 1918	E. THIBAUDEAU, Wis.	Apr., 1917
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R. COLVIN, Ind.	Apr., 1918	J. M. BROWN, Tex.	Apr., 1917
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JOS. BOYER, Mich.	Dec., 1916	WESS POTER, Mich.	Apr., 1916
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J. H. W. SCHNEIDER, Cal.	Dec., 1916	J. B. WILDASIN, Pa.	Apr., 1916
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F. F. DARLING, Cal.	Dec., 1916	B. PETERSON, Minn.	Apr., 1916
CHAS. NEWLAND, Cal.	Dec., 1916	H. R. HAYNES, Mo.	Apr., 1916
J. T. BRAHM, Ia.	Dec., 1916	S. H. AMES, Pa.	Apr., 1916
P. H. ST. LOUIS, Wis.	Dec., 1916	KASS BROS., Ill.	Apr., 1916
A. E. NICKOLS, Okla.	Dec., 1916	J. MCGARVA, Ill.	Apr., 1916
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BOB FRICK, Ala.	Dec., 1916	R. H. KUERTS, Iowa	Apr., 1916
JORRIS BROS., Tex.	Dec., 1916	WELSH BROS., Ind.	Apr., 1916
R. CLEMENS, Conn.	Dec., 1916	KELLNER BROS., W. Aus.	Apr., 1916
SCHREFFLY & SCHMITT, Pa.	Dec., 1916	P. A. PETERSON, Ia.	Apr., 1916
A. BRAUSE, Ohio	Dec., 1916	G. F. BOWERS, Okla.	Apr., 1916
J. E. BRATTY, Mo.	Dec., 1916	D. E. McDONALD, Fla.	Apr., 1916
GEO. CASSIE, Scotland	Dec., 1916	JAMES BAXTER, S. Africa	Apr., 1916
JOHN KAIN, Ky.	Dec., 1916	E. P. DIGNAN, S. Aus.	Apr., 1916
F. W. HOWELL, Ill.	Dec., 1916	W. H. WINGET, Vt.	Apr., 1916
H. A. CHEEVER, N. H.	Dec., 1916	W. B. WATERS, Ill.	Mar., 1916
W. M. GRIFFITHS, Aus.	Nov., 1916	L. E. TURNER, Kans.	Mar., 1916
W. B. TAYLOR & SON, Mo.	Nov., 1916	H. CORNELL, Ore.	Mar., 1916
G. WHITTEN, Mass.	Nov., 1916	FRIEND BROS., Mass.	Mar., 1916
J. M. VINCENTA, Wis.	Nov., 1916	S. J. WARREN, Mo.	Mar., 1916
TOM NOLAN, S. Aus.	Nov., 1916	S. OLDING, Ohio	Mar., 1916
H. J. FRENCH, N. Z.	Nov., 1916	W. T. HELLSAEBCK, Ill.	Mar., 1916
F. N. BROWNING & SON, Ky.	Nov., 1916	C. M. MERITHEW, Mich.	Mar., 1916
J. MACGAB, Scotland	Nov., 1916	O. MARTINSON, N. D.	Mar., 1916
P. GESSER, Ill.	Nov., 1916	C. DECKER, N. Y.	Mar., 1916
J. W. GRIMBLE, S. Aus.	Nov., 1916	COLLIN MUNRO, Tex.	Mar., 1916
W. G. SIM, N. Z.	Nov., 1916	W. H. TUTTLE, Mass.	Mar., 1916
H. V. RUEHL, Ala.	Nov., 1916	J. A. SEGARS, Me.	Mar., 1916
G. LINDBERG, Ind.	Nov., 1916	H. F. DISINGER, N. Y.	Mar., 1916
PITTMAN STELL, N. C.	Nov., 1916	W. H. CRUMLY, Ind.	Mar., 1916
J. S. FINKENBERGER, Ind.	Nov., 1916	M. C. THORP, Tenn.	Mar., 1916
R. D. WILKOM, N. Y.	Nov., 1916	D. BLYTHE, Iowa	Mar., 1916
J. MIKULIK, Tex.	Oct., 1916	S. D. METZLER, Kans.	Mar., 1916
C. W. SCHMIDT, Cal.	Oct., 1916	SHORT BROS., Iowa	Mar., 1916
T. J. MAGUIRE, N. Y.	Oct., 1916	CHAS. WHITE, Penn.	Mar., 1916
A. W. WAITE, Cal.	Oct., 1916	W. LINCK, N. Y.	Mar., 1916
C. W. ELLIS, Tex.	Oct., 1916	J. J. HRACKOVEC, S. D.	Mar., 1916
J. P. SIMON, N. S. Wales	Oct., 1916	A. E. HOUCK, N. Y.	Mar., 1916
E. A. KNAPP, N. Z.	Oct., 1916	E. A. PROUTY, Mass.	Mar., 1916
T. J. HASKINS, N. S. W.	Oct., 1916	GUST LENZ, Mich.	Mar., 1916
LOTHIAN & SKINNER, N. S. W.	Oct., 1916	J. CLIFFORD, Minn.	Mar., 1916
W. B. KNOUFF, Ala.	Oct., 1916	E. GRISE, Mich.	Mar., 1916
GORHAM BROS., Ia.	Oct., 1916	GEO. TEMPEL, N. Y.	Mar., 1916
W. H. F. BRACHE, N. C.	Oct., 1916	G. W. BRYANT, Vt.	Mar., 1916
CLARK OLDS & CO., Neb.	Oct., 1916	T. GAMESTER, N. H.	Mar., 1916
IRWIN SCOTT, N. Y.	Oct., 1916	P. F. HONESHOGAN, N. Y.	Mar., 1916
C. E. DURHAM, Kan.	Oct., 1916	T. J. HARVEY, Ill.	Mar., 1916
M. RINGO, S. Africa	Oct., 1916	W. E. HART, Okla.	Mar., 1916
W. DELLEY, Queens, Aus.	Oct., 1916	C. SCHMID, Neb.	Mar., 1916
T. M. BLACKMAN, Pa.	Sept., 1916	J. SHARPLES, N. J.	Mar., 1916
G. H. TORLINE, Kans.	Sept., 1916	A. ROCKENSCHUP & SON, La.	Mar., 1916
S. B. PHILLIPS, W. Va.	Sept., 1916	C. H. ALEXANDER, N. Y.	Mar., 1916
G. E. HARPER, Texas	Sept., 1916	A. M. HAREBO, Wis.	Mar., 1916
J. J. ILLER, N. S. Wales	Sept., 1916	GEORGE HOWARD, Kan.	Mar., 1916
JAMES PORTTIGN & CO., Mo.	Sept., 1916	G. N. FOLLMAR, Neb.	Mar., 1916
JNO. GOETZINGER, Ia.	Sept., 1916	W. WILLOUGHBY, Mich.	Mar., 1916
GEO. FLECKENSTEIN, Cal.	Sept., 1916	H. HOFFMEYER, N. J.	Mar., 1916
GEO. HILL, Aus.	Sept., 1916	FRANK L. LOCKE, N. Y.	Mar., 1916
E. C. BEARD, Aus.	Sept., 1916	FRANK L. EVARTS, Conn.	Mar., 1916
J. K. GLINICKI, Mich.	Sept., 1916	C. R. WINGET, Vt.	Mar., 1916
OSCAR BURNER, Md.	Sept., 1916	H. & J. CHISHOLM, N. Z.	Mar., 1916
A. J. HAMMOND, Cal.	Sept., 1916	C. F. MOKKENTEN, Aus.	Mar., 1916
ROBERT MURRAY, Cal.	Sept., 1916	H. D. PHILLIPS, S. Aus.	Mar., 1916
D. E. WRIGHT, Pa.	Sept., 1916	J. B. FRY, Wash.	Mar., 1916
J. S. HASKELL, Col.	Sept., 1916	L. A. DOWNING, Cal.	Mar., 1916
R. SOMMER, Aus.	Sept., 1916		
J. A. SEQUIN, Can.	Aug., 1916		
JAMES CLARKE, Jr., Aus.	Aug., 1916		
DISPATCH Fdy. Ltd., N. Z.	Aug., 1916		
A. A. BAHKE, N. D.	July, 1916		
ERNEST E. DOTTY, Ohio	July, 1916		
F. C. ASHTON, Pa.	July, 1916		



Ten Questions for the Month

The questions this month are on vehicle-building and repairing, and have been formed to bring out some practical, helpful hints rather than to principles of vehicle construction. There are, no doubt, several correct replies to each question asked, but it is intended to bring out the best method in each case. The replies next month will be given with this point in mind.

1. In respoking old hubs, what method is best to use to remove dirt and grease from them?

2. How may an old box be removed from a hub in which it seems to stick tightly and resist all efforts toward its removal?

3. When a box becomes loose how can it be fastened in the hub, securely?

4. Is it best to use glue thick and heavy or thin in vehicle work?

5. In driving spokes into an old hub, what can be done if grease has accumulated in the mortise?

6. Why, in order to get best results, should glue be made fresh when two or three days elapse between gluing jobs?

7. How can good glue be judged before it is prepared or used?

8. Why is it not good practice to cut hub mortises very long before the hub is used?

9. Is it best practice to put the dish in a wheel by shrinking on the tire or in building the wheel?

10. Is it best to give the hub box a solid bearing throughout its length or a "two-point" bearing? Why?

Answers to Questions in May Issue

1. The hardening of steel is brought about by a molecular change caused by the heating in combination with the sudden cooling. This is probably best explained as follows: the hardened steel containing carbon holds that carbon in suspension—that is the carbon molecules or infinitesimal particles of carbon, while in the bar, have not combined with the molecules of iron. In other words the carbon molecules are simply distributed through the bar and have not been absorbed. Heating the steel, however, causes the carbon to

be absorbed by the molecules of iron and if the steel is allowed to cool slowly the carbon molecules will again disintegrate and go back to their original form; but when the steel is quickly cooled the carbon becomes fixed in its combination with the iron and the result is a hardening of the metal.

2. In annealing steel the metal is heated and then slowly cooled. The heating causes the carbon to be absorbed by the metallic molecules, but, in cooling, the carbon again separates and re-assembles itself even more completely than in the original bar.

3. In hardening steel, stresses and strains are produced in the metal which if not relieved may result in the cracking of the steel. The steel is tempered to relieve these strains and to give the metal a certain degree of toughness in which an equalization of the strains in the metal must naturally result.

4. The tempering colors are due to the oxidation of the surface of the metal. This oxidation at the different decreasing temperatures produces the changes in color.

5. The application of heat to effect different changes in the condition or structure of a metal: It may or may not be combined with simultaneous mechanical treatment.

6. Sulphur causes brittleness in the metal, and as its effect upon iron is especially disastrous at welding temperatures it makes welding difficult; and even when the welding operation is completed the resulting joint is not likely to be safe.

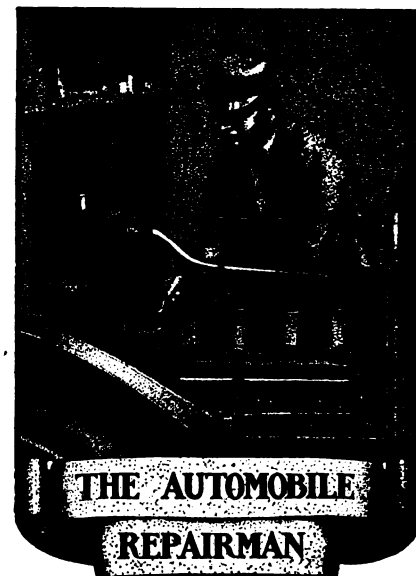
7. Iron is a metallic element occurring chiefly in combination with other elements, and seldom found in its metallic condition. As iron ore it is reduced and refined by heat, and thus we secure the iron of commerce. Steel is a form of iron produced in a fluid condition, practically free from slag and containing a certain percentage of carbon, ranging from 0.15% to 2.20%. In short, iron that can be forged and tempered, and when heated to certain temperatures and then cooled becomes hard, is known as steel.

8. When iron or steel is heated under ordinary conditions the surface of the metals oxidize—a film of iron oxide forms. The flux sprinkled on the heated metal, melts, flows over the surface of the metal

and forms a protective cover, preventing the formation of the oxide and dissolving that already formed.

9. The principal difference is the carbon content and the slag contained in the wrought iron.

10. The metal crystalizes and becomes brittle.



The Care, Repair and Operation of the Automobile—6*

(With Special Reference to Overland Cars)

Wheels

When in consequence of an accident a steering knuckle of the steering cross rod—also called the drag link—has become bent, the alignment of the front wheels has to be re-established, because any disalignment of the front wheel set is certain to destroy the tire in a very short time.

The front wheels of Overland cars, when correctly aligned, are not exactly parallel, but "toed in." To test their proper alignment, jack up both front wheels, and with a piece of chalk or lead pencil, held in a fixed position against the tire, spin the wheels; drawing a line around the tire casing. The distance between the lines measured at the front of the wheels should be from $\frac{3}{8}$ to $\frac{1}{2}$ inch less than in the rear. (Fig. 1.)

If a steering knuckle is bent, it is best to replace it with a new one, because bending it cold will not always restore its correct shape, while heating it may make it too soft.

*Copyright by Willys-Overland Co.



If disalignment is due to a bent steering cross rod it may be straightened out and adjusted by loosening the lock-nut and screwing the rod in or out of its yoke end. Be sure to lock the nut tightly after adjusting.

The front wheels are also "set" or "cambered" so that the wheels are a little closer together at the bottom than at the top. This arrangement is desirable, on account of the fact that the front wheels are "dished" so as to make the wheel a sort of flattened cone. This "dish" of the wheel is compensated by the "camber," by which means the lowest wheel spoke is in a vertical position with relation to the road surface. The combined "toeing in" and "cambering" make for greater strength and also reduce materially the effort required in steering the vehicle. The "camber" is secured by inclining the axle spindle from

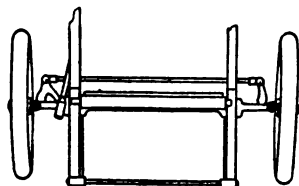


FIG. 1—THE FRONT WHEELS

its central line, and no adjustment is required in connection with it.

Front Wheel Bearings

To keep the bearings well lubricated, pack them with graphite grease; fill the hub cap with the same grease and screw it down tight.

To see whether the front wheel bearings need adjustment, jack up the wheels, when any looseness will show on rocking the wheel sideways.

To tighten the bearing, spin the wheel, at the same time screwing down the notched adjusting nut until the bearing is so tight that it will stop the rotation of the wheel. Then back off the nut only enough to allow the wheel to spin. Lock at this point and the bearing will give the best service. (Fig. 2.)

In general, a somewhat loose bearing is to be preferred to one that is so tight that the rollers are likely to become injured.

Once in every 1,000 miles of running, the front-and-rear wheel bearings should be examined. If one of the rollers should have become damaged it is better to replace all

the rollers; thus insuring that the whole set is of the same dimensions. In any case it is best to order repairs from the factory.

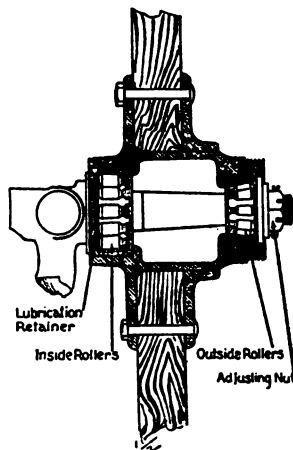


FIG. 2—THE WHEEL HUB AND BEARING

For lubricating wheel bearings use a good, light graphite grease; spread it over and into the bearings and fill the entire hub cap with it.

The bearings should at all times be free from grit, and it is a good precaution to flush them with gasoline whenever you supply fresh lubricant.

Brakes

The foot-brake is the regular service brake. The hand-brake is for emergencies and for use when it is desired to set the brake while the car is standing still.

The service brake consists of an external contracting band, and the emergency brake of two internal expanding shoes or segments; the shoes are hinged at their ends and a cam between the free ends separates them when the internal brake is applied.

It is important that the brakes be evenly adjusted, so that when either set is applied there is the same braking effect on both rear wheels.

The service brake is adjusted in two ways; fine adjustment being

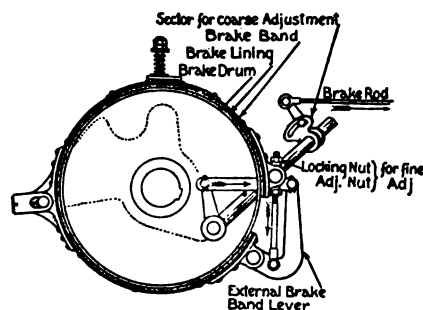


FIG. 3—SHOWING THE EXTERNAL OR REGULAR SERVICE BRAKE

secured by a shortening of the external brake-band lever, as shown in Fig. 3.

When the play in the brakes becomes more noticeable it may be taken up also at the adjusting sector.

Any slight difference in the amount of service-brake pull on either side is compensated by the service-brake equalizer.

The emergency brakes, which are seldom used and therefore subject to very little wear, are tested and adjusted by jacking up the rear wheels and turning them by hand with the emergency brake partially set. Any difference in the brake pull on either side, or any looseness, may be taken up at the adjusting sectors of the emergency-brake rear rods. (Fig. 4)

When adjusting the brakes, do not have them so tight that they "drag." A dragging brake uses up power and wears out the brake lining in a very short time.

There is no part of the automobile that is more neglected by the average user than the brakes; they are of the utmost importance, however, and there should be no disregard of

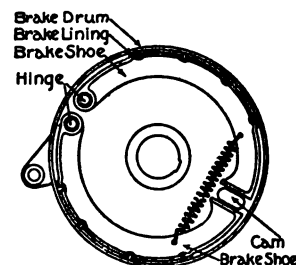


FIG. 4—INTERNAL OR EMERGENCY BRAKE

the precautions necessary to insure their dependable condition at all times.

The service-brake bands are easily removed for relining. When the emergency-brake shoes are to be relined, the rear wheels must be taken off.

Sometimes, in touring mountainous country, wear of the brake linings and heating of the brakes may be materially reduced by using the engine itself as a brake.

Many motorists, when going down a very long hill, check the progress of the car by disconnecting the spark, throwing in the clutch with the low speed engaged; thus letting the onward movement of the car turn the



engine over against its own compression. Since the air taken into the cylinders at each suction stroke must be compressed on the next stroke, considerable resistance must be over-

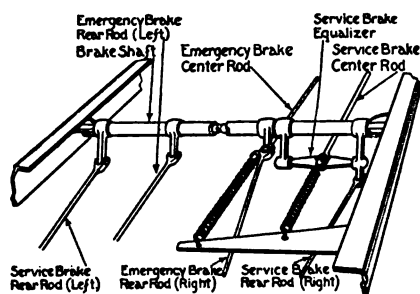


FIG. 5—SERVICE AND EMERGENCY BRAKE RODS AND SERVICE-BRAKE EQUALIZER

come, and in this manner a very powerful braking effect is obtained.

In braking the car with the engine, care must be taken; and no motorist unless he is fully familiar with the operation of his car should undertake it.

A point of importance is that the low speed be engaged just before the decline is reached; because changing gears while the car is rapidly descending is apt to have disastrous consequences.

The motor when used in the way explained makes a very powerful brake, saves the ordinary brakes and gives greater security to the operator.

The spark should be given shortly before the bottom of the hill is reached, in order to start the power of the motor.

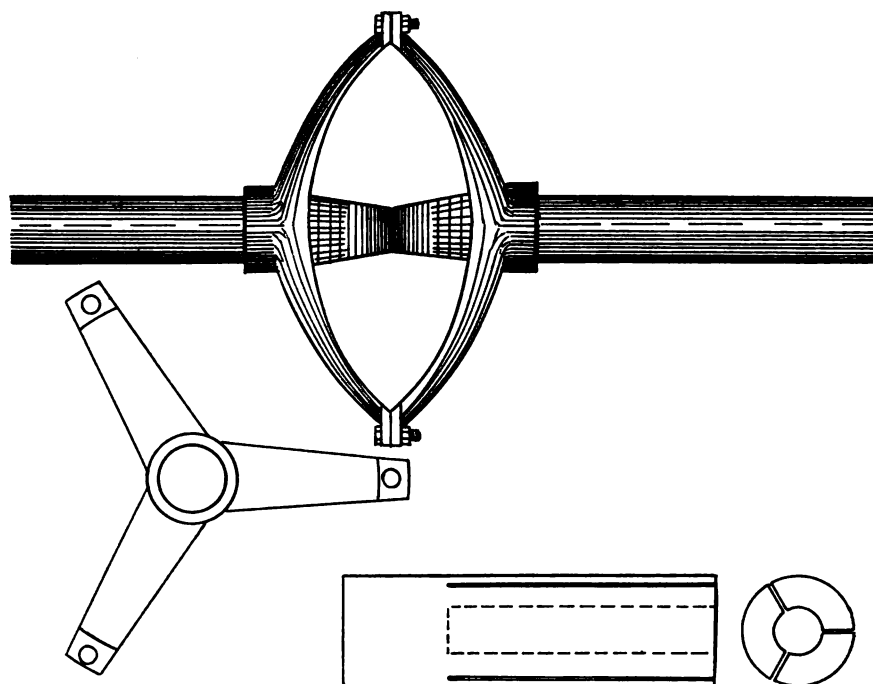
(To be continued)

Repairing a Broken Rear-Axle Housing

W. D. BOETTLE

The accompanying engraving shows a wrought-steel axle-bracket that I made for a motor car. I was unable to have a pattern made and then, too, there is no foundry to make the casting. Of course I could have had the casting made at one of my neighboring towns, but it would have been made out of common iron, and it would also have been necessary to have such a casting very heavy, in order to stand the strain and load that it would have to hold. And to have it made out of malleable iron would require sending it to some malleable iron factory, which would have taken considerable time, as the

malleable iron foundries are very busy all the time. So I went to work. I got a three-inch mild steel bar and cut off two pieces, eleven inches long each, centered them and put them in the lathe and drilled a one-inch hole $7\frac{1}{2}$ inches deep endways in each piece, then I put them in the forge and took some good heats on them and with a thin cleaver (and with the aid of my helper) I split them endways in three places as far as the hole was drilled, to make three prongs. Then I took a good heat at the end of the splits and straightened out the prongs. After we had the two pieces straightened out we took a heat on each prong end (one at a time), fullered them and then with a set hammer made a shoulder on the inside end and worked on the heads for the bolt to go through. After forging all the heads we then drew out the arms to the proper size and lengths to receive a fourteen-inch sprocket so that it would turn freely without catching the chain. I bent the arms over far enough to face up the heads in the lathe. I then put them in the lathe, bored out the hubs



HOW A BROKEN AXLE HOUSING WAS REPAIRED

just a little smaller than the axle housing, machined the inside of the arms and heads and shrunk them on the axle housing, put in the differential and put together. They are on the car yet, and the owner has never had any more trouble with broken axles.

"I Didn't Think"

GEO. WORSHIP

I fully agree with your apt remarks on the all too prevalent every-day expression: "Really, I didn't think." It is indeed all too apparent the number of people who, merely for the lack of the necessary little thought, foresight, originality and observation, get into the habit of the aforementioned "groove." The following episodes strike me as being very notable examples:

A peddler tramping along a country lane, heavily burdened with his wares which he carries in a sack swung over one shoulder balanced with a stone of about equal weight at the end of a rope, on being asked the reason for carrying the stone instead of dividing his goods or wares, his answer was, "Dunno. Father found it good enough, and what was good enough for him is quite good enough for me." Did he think?

In school, one day, the instructor was trying to instill into the dense minds (as he thought) the advantages of observation in every-day life.

During his remarks he at intervals named figures which he wrote on the blackboard, but in each case he reversed the figures as he wrote them. For example, he named 83, but wrote 38, etc. The instructor could not overlook the fact that one little chap in the rear of the class seemed



on the alert and somewhat uneasy. So the instructor asked him if he wished to ask a question; "yes, sir", was the reply. "Well, what is it my little chap?" "Please sir, write 77 and twist that if you can." He did think.

So say I, we still are all and are likely to remain pupils of knowledge, and I am certain that all who desire to progress must seek the same.



Hardening and Tempering Taps and Dies

BERT HILLYER

The "kink" I am sending will be welcomed by the smith who has had trouble in hardening tools, caused by the pieces warping and cracking. For instance, a piece is brought from the machine shop which has to be hardened, as a special tap or die. To heat it in the forge fire would ruin the teeth with their delicate sharp corners, and to heat it inside of a piece of pipe is not satisfactory, though better than the open fire.

Now, to get the best results, steel should be heated where it comes up to the refining heat, gradually, and all air be excluded at the same time. Cyanide of potassium and salt, melted together in a ladle or iron vessel of any kind, does the trick to perfection. About $\frac{3}{4}$ of a teacup of salt to one pound of cyanide is about right. The tap is placed in this and it is all brought up to a red heat over the fire. It is then taken from the ladle and plunged into a small can of water that is being held over a pail of oil. The can is then pushed down into the oil to the bottom and the tap is

drawn up from the water into the oil as shown. It is moved up and down in the oil until it has finished cooling.

Now the winning points in this method are in heating in cyanide. It heats evenly, with no air to get to it, and for this reason the tap comes out clean. Also the can of water has just enough time to harden the outside surface extremely hard; and when the tap is pulled up in the oil the rest of the cooling goes on slowly; leaving the tap soft and tough on the inside.

The writer does not think it possible to crack a piece of steel hardened by this method, unless the steel has been abused with high heats or improper forging or annealing before it reached the hardening process.

It should be remembered that cyanide is deadly poison and any carelessness may result in a slow ride to the family burying ground. Also keep wet tongs or irons out of it when it is melted or it will fly all over. Heating the tongs slightly before putting into the ladle makes it safe on this part.

Working Carbon Steel

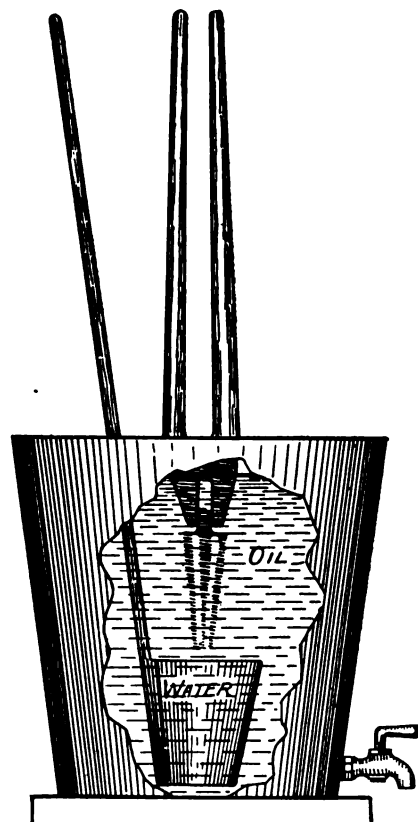
The Furnace, the Bath, the Temperature, the Work

A. C. GOUGH, M. E.

The characteristic appearance of carbon steel is its silky or silvery fracture. It is very elastic, hard, ductile and has great tenacity, but does not withstand shocks nearly so well as mild steel or wrought iron. Any high carbon steel is much more difficult to weld than wrought iron, but the most marked feature in which it differs from wrought iron is its ability to acquire different degrees of hardness. As may be shown, the degree of hardness which may be obtained depends upon the presence of certain foreign substances, the chief of which is carbon. Nickel, chromium, manganese and tungsten also render steel hard, with certain other properties which may be discussed at another time.

When an ingot of steel is cast, and allowed to cool, its temperature does not fall continuously as might be supposed. It solidifies at about 2,600° F., and from that point the temperature falls in equal divisions of time until the temperature of dull redness, about 1,250° F., is

reached. At this point the temperature ceases to fall, and if it does not increase slightly it remains stationary. After a short time it again falls regularly as before until the steel is cold. The point at which the temperature remains constant or increases slightly is called the recalescent point. At this point the internal structure of the steel undergoes important changes. The ingot of steel begins to crystalize at the point of solidification, but when the temperature has fallen to the recalescent point this crystalization ceases. Should the ingot of steel be heated again



TEMPERING TAPS AND DIES

to any temperature below that of the recalescent point, the crystalline form of steel is not affected, but as soon as the temperature becomes higher than this point the steel loses its crystalline structure.

When a billet of steel is to be forged, its temperature should be above that of the recalescent point (1,250° F.), never below it, as then the forging would tend to develop cracks and other faults in the interior of the piece.

Blows that are not heavy enough to affect the interior of the forging



should not be practiced. The consequence of such practice is that only the outside fibres are really forged, the interior remaining unchanged in structure. Since the blows are not heavy enough to cause a flow of metal in the center, the piece of steel which has been forged by blows too light shows cup-shaped ends. This is caused by drawing the outside fibres with the hammer while the center remains unchanged. This stretching of the outside tends to pull the center apart, forming spongy places along the center of the piece. If the blows are heavy enough to penetrate to the center of the mass and cause the metal at the center to flow longitudinally the end of the forging will appear convex, while the structure of the material will be uniform from center to outside.

When steel has been unevenly forged, and in consequence of this has lost its uniformity of structure, it may be restored to its normal condition by heating it to a medium bright red and then packing it in hot sand, hot dry ashes or air-slacked lime, allowing it to cool slowly. Annealing in this way is sufficient for ordinary work, but the large steel castings and steel forgings are usually annealed by putting them into a furnace where they are heated to a dull red and then cooled slowly by closing the furnace, allowing the fire to go out. This method requires considerable time—some times, several days.

Chains, rings, hooks and similar equipment of the shop are usually annealed in this manner, they being put into the furnace toward the close

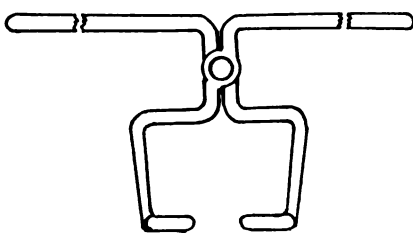


FIG. 1—THE CRUCIBLE RONGS

of the week and taken out Monday morning. Iron forgings are also annealed in this manner.

If steel is heated to a medium red and then chilled suddenly it becomes hard. The degree of hardness assumed depends upon the suddenness of chilling, the latter depending upon the

method of chilling. A blast of cold air may be used to chill the steel. This can be regulated to suit demands within limits. Oil chills slowly, water quickly, salt solution more quickly, and mercury chills very suddenly. Certain salts may be dissolved in the water used for chilling the steel that will effect a more rapid cooling. Some because they are good conductors of heat, others because they tend to retard the formation of steam on the hot surfaces. The following are some of the common hardening solutions:

Common Salt Solution.—One of the simplest and best hardening solutions consists of a saturated solution of common salt and soft water. This solution is used very extensively by tool smiths.

Compound Salt Solution.—Dissolve in 2 gallons of soft water, 1 ounce rock salt, 1 ounce saltpeter, 1 ounce salammoniac and 1 ounce of bi-chloride of mercury. Steel is heated to a medium red and dipped in this solution. The solution is also very good for cooling when tempering as well as for hardening. (Use care in handling and storing—it is poisonous.)

Chloride of Zinc Solution.—Steel may be made very hard by heating it to a bright red and plunging it into a solution of chloride of zinc. This solution may be made by dissolving zinc in diluted muriatic acid. (Hydrochloric.)

Mercury.—Being a good conductor of heat, mercury takes the heat away from the immersed steel very rapidly, thereby chilling it quickly, making it very hard. Many of the higher carbon steels will crack when plunged into these rapidly cooling baths. It is necessary to harden them in oil or air and have special means for heating.

It is absolutely necessary to have a tool heated evenly before hardening. It is often necessary to have a special kind of furnace to accomplish this as referred to later. When handling work which may be heated in the forge, care should be taken to avoid getting corners and thin parts too hot. Also, great care must be taken in dipping tools for hardening or tempering to keep them in the water long enough to get the steel chilled throughout. When the tool is dipped the outside becomes chilled and contracts, forming a hard, brittle shell

over the heated and expanded interior. As this interior cools it also contracts, but being held to the already hardened shell it cannot contract to its original size. This causes an internal strain in the steel that

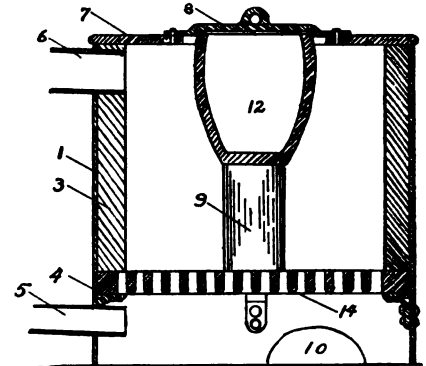


FIG. 2—THE CRUCIBLE FURNACE

may cause it to crack. For this reason carbon steel should not be more than a medium red heat when plunged into the hardening solution.

If a piece of hardened steel be slowly heated it slowly becomes softer as the temperature is increased. In this way it may be partially annealed to the desired degree of hardness. When this desired degree of hardness is reached, the steel is again quickly plunged into a cold liquid (usually water). The degree of hardness assumed at any point of this partial annealing may be judged by the color. When the steel is hardened it has a mottled appearance, but if it be rubbed bright and the temperature raised slowly the surface will be found to pass through a series of colors.

The colors in the order in which they appear are generally known by the following names: Very pale yellow, pale yellow, full yellow (straw), brown, brown with purple spots (copper color), purple, light blue, full blue, dark blue and gray.

The accompanying table shows what colors are produced at various temperatures, also a few tools which are tempered to the various degrees of hardness obtained at these temperatures. The temper should be drawn slowly. Different makes of steel vary somewhat as to the degree of hardness corresponding to a given color. The table represents an average.

COLOR	TEMP.	SPECIMEN
Very pale yellow...	430° F.	Lancets
Pale yellow.....	450° F.	Razors, etc.
Full yellow (straw)...	470° F.	Drills for iron
Brown.....	490° F.	Cutlery, shears, cold chisels



COLOR	TEMP.	SPECIMEN
Brown with purple spots.....	510° F.	Axes, planes, wood chisels
Purple.....	530° F.	Large shears, augers
Light blue.....	550° F.	Swords, spring
Full blue.....	560° F.	Saws, augers
Dark blue.....	600° F.	Saws

The colors are caused by the oxidizing of the surface of the steel. It is generally granted that the amount and character of this oxidization is affected only by the temperature. Therefore, we are able to recognize the temperature and degree of hardness by the color of the oxide upon the surface, but the rate at which the air is passing over the surface or a lack of oxygen in the air immediately in contact with the surface may affect the color. This was brought to the attention of the writer only a few years ago in the following way: Two machinist hammers were to be hardened and tempered, and as the equipment did not include a muffle furnace a piece of wrought iron pipe about 18 inches long closed with fire clay at one end was used by heavily banking it over with coal in the forge and using a light blast. The wrought iron pipe should have been about 4 inches in diameter, but a 2½-inch pipe was the largest in stock, which was rather small for this work. Each hammer was supported in the pipe by a small rod and when the medium red heat was reached they were plunged into linseed oil. Each hammer came out of the oil with a nice mottled surface and when tried with the file showed uniformly hard. The hammers were polished, and the pipe having cooled somewhat they were again supported within the improvised muffle until they showed a full yellow.

As the pipe was not uniformly hot it seemed remarkable that the hammers so readily took on a uniform yellow which did not change, but it was a greater surprise to find the hammers extremely soft except in a few spots. It was found that the hot pipe and the hammers during the heat for hardening had taken up the oxygen contained within the pipe to such an extent that there was not enough oxygen left to show the usual color which should accompany a certain temperature. This was proved by admitting fresh air for tempering, when the degree of hardness expected was obtained.

There are numerous methods for hardening and tempering, but it's

only the blacksmith with skill in working steel that will always dare to make a tool with no furnace except the forge to complete the job. Machinists and others without the ability to readily recognize the condition of the metal by its color, and manufacturers who insist upon accurate and uniform results at all times, employ methods which require less skill with better results.

The number of types of furnaces upon the market even exceed the

used for a brass, annealing, case-hardening, hardening and tempering furnace, including lead. It may be constructed as follows: Secure a length of a smokestack, boiler or flue, as at 1, in Fig. 2, 18 inches in diameter and four feet or more in length—the dimensions may vary according to requirement. A grate may be found in the scrap pile or one may be improvised, but the better plan would be to make a pattern and then a casting as shown by 14. The

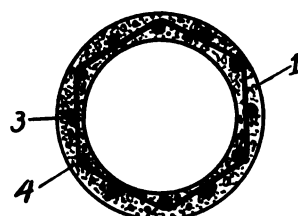


FIG. 3.

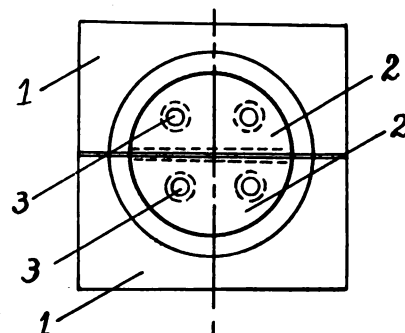
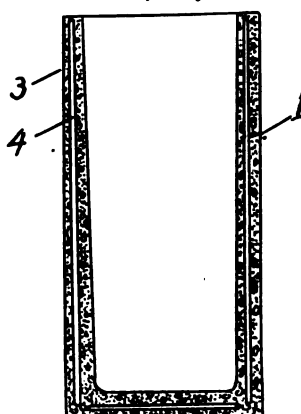
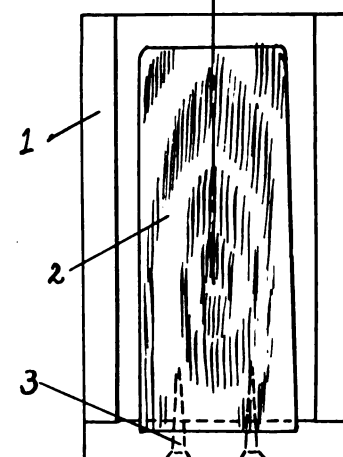


FIG. 4



AN EASILY MADE MUFFLE, MADE ON A WOODEN MOLD AND REINFORCED WITH WIRE

great number of methods, and many of them are so well designed and constructed that it is a pleasure to use them. But to equip a shop with furnaces especially for the purposes mentioned here could only be done at an expense which would usually exceed the cost of all other equipment in the forge shop. However, this does not question the value nor the desirability of possessing the various furnaces required for the work in hand. But in connection with this a design for a shop-made furnace is offered which it is believed may help out certain small shops for a few years or at least until the work demands more elaborate equipment.

The furnace shown here may be

grate is placed upon the brackets, 4, and then the furnace may be lined with fire clay as at 3, about two inches thick, leaving an opening at the top for the flue, at 6. Unless a large, high stack is used it will be necessary to connect a blower as shown at 5, but only a very light blast will usually be required. The opening shown at 10 may be used for removing ash, and should be closed by a hinged door or it may be closed with a piece of clay. The covers, as at 7 and 8, should be castings, though they may be made of any convenient material.

When using this furnace for melting brass, aluminum, etc., the fire being started with a bed of coke, the



crucible stands upon this bed with coke packed around to hold it upright—as done with the common type of brass furnace.

(To be continued)

Electroplating—How to Make the Equipment

ALBERT WAYCHOFF

Every blacksmith who runs a general shop should have a small electroplating outfit in his shop. The profits of this work are enormous. The work is very simple in itself, and every one has plating to do—watches jewelry, tools, knives, forks, skates and bicycle and gun parts—in fact in a short time any blacksmith can add from fifty to seventy-five dollars monthly to his income.

It is not necessary to be a chemist or an electrician to do plating. The main point is to use care in the work, and you will succeed. The metal is deposited by suspending it in the plating tank which contains a solution of the metal used for forming the plate. From another wire a piece of the metal is hung in the solution. The article to be plated is then connected to the negative pole of the battery, while the piece of metal is connected to the positive pole. The metal is known as the anode, while the article to be plated is known as the cathode.

The illustration, Fig. 1, shows a simple plating outfit to better demonstrate the working of a plating plant. In the engraving, A is a copper wire which is laid across the top of the tank. From this wire the

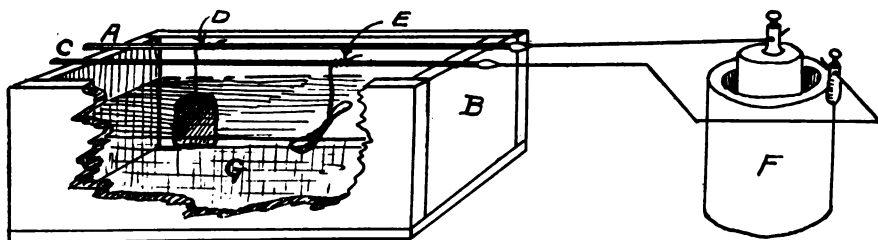


FIG. 1—HOW A PLATING PLANT WORKS—A SIMPLE OUTFIT

anode, D, is suspended in the solution, G. The anode is a pure sheet of the metal of which the plate is to be made. Another copper wire, C, is used and from it the article, E, to be plated is suspended in the solution. The tank, B, holds the solution, while F is the battery.

The plating is done as follows: The metallic solution in the tank conducts the electric current from the battery so as to dissolve the metal from the anode, and following the current deposits it on the cathode or article to be plated.

1-pint glass dish is best. All tanks should have covers when not in use in order to keep the solution perfectly clean.

You will then need three batteries which with the tanks are arranged as shown in Fig. 2.

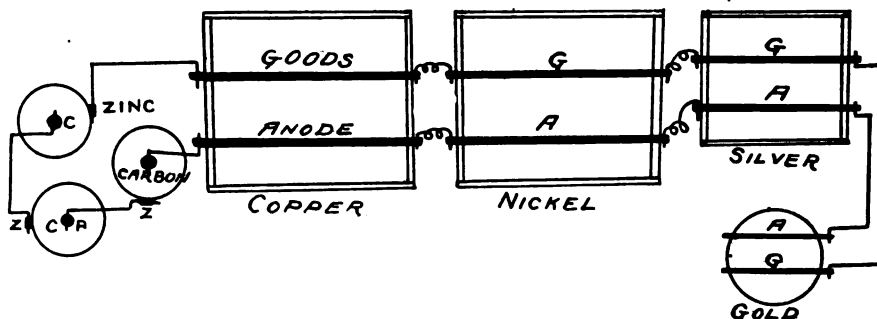


FIG. 2—HOW THE VARIOUS METALLIC BATHS ARE ARRANGED AND CONNECTED WITH THE BATTERIES

The tanks are made of good wood, well nailed together and then painted with good quality asphaltum varnish. They can be made any size to suit the requirements, but I would advise making small ones at first for trial. By getting catalogs from various manufacturers of platers' supplies you can get an idea of the sizes. You need these catalogs anyway to purchase your anodes.

To all readers who will send me a stamp or two I will send a complete list of the manufacturers and supply houses who furnish these goods. The batteries can be of any kind, but I would recommend the Fuller or Monarch Wet Batteries.

For making an outfit, the first articles to be made are the tanks. For a small outfit I would make a copper and nickel tank about 10 inches wide, 8 inches deep and 14

The rods for the top of the tanks are of copper and about $\frac{1}{8}$ inch in diameter. They are simply laid on top of the tank and the wires attached to them. The anodes are then hung on one wire (the one running from the carbon part of battery), while the article to be plated is suspended from the other. When this is completed your plating outfit is finished and you are ready to make the solutions.

To make Copperplating Solution take: 98% Cyanide of Potassium, $\frac{1}{2}$ lb., pure water, 1 gal., Dry Carbonate of Copper, $\frac{1}{4}$ lb.

Dissolve the Cyanide of Potassium in the water, using a glass or porcelain dish only, then add the Carbonate of Copper. Mix this up cold as heating would spoil it. It is then ready to put in the copperplating tank for use. The anodes should be pure copper. This solution requires from fifteen to twenty minutes to deposit a good plate. The goods should be gently moved in the solution once or twice while plate is being deposited.

To make the Nickel Solution: Take a porcelain dish or crock and dissolve $\frac{3}{4}$ of a pound of Double Salts of Nickel and Ammonia. Put the Nickel Salts in a small cloth sack and hang it on a wire in cold water. When dissolved this solution is ready for the nickel tank. The anodes are pure nickel, are very cheap and can be secured from the address which I will give you if you write me.

For Silverplating Solution take: Distilled or rain water, 1 qt., Silver

inches long. As before mentioned, these tanks should be made of nice clear wood, and after they are finished line the inside completely with asphaltum. For a silver tank, one 6 inches deep, 12 inches long and 6 inches wide will be large enough for the beginner. For a gold tank, a



Chloride, $\frac{3}{4}$ oz., Potassium Cyanide C. P., $1\frac{1}{2}$ oz.

Dissolve the Silver Chloride and the Potassium Cyanide in the water and it is ready for use.

The silver anodes are generally 95% pure silver.

The Goldplating Solution requires special laboratory outfits, therefore it is best to purchase it ready for use.

This completes the whole plating outfit and it is ready for use. The whole thing is very simple and easily made and the expense is very small. An outfit of this kind will enable you to earn from \$5.00 to \$7.00 per day. It may seem that the metals are expensive, but when you consider that the thickness of a plate is from .005 to .015 of an inch, a small piece of metal goes very far. The solutions never give out, as they keep feeding and retain their strength from the anodes.

You now have the outfit. Next month I will give full details for preparing the work for plating and for putting on the plate. There are about a dozen supply houses who furnish anodes and other supplies; it will pay you to get their catalogs.

Drop Forging: What It Is, How Done and How the Dies are Made

JOHN CUNNINGHAM
PART 2

The Dies

In direct relation to the forge shop is the die sinking department where the more skilled workmen are employed. This class of die work is a trade in itself. Not being a diemaker I shall not attempt to give you the essence or nature of this work, but take the liberty of quoting a writer on the subject: "The making of drop forge dies, together with the hardening process through which they are put, is a trade in itself, though closely allied to tool and die making as understood in the big shops of today. Each branch of shop work presents its individual problems; and a tool and die maker though skilled in other lines can not go into a forging shop and make drop forge dies without special instructions and training."

In drop forge die work, as in other kinds of tool work, there are various grades of accuracy and finish required. Some forgings must come from the hammer practically finished to size, while others are made large enough to allow considerable machining. Where only a few pieces of a rough nature are required, little skill is needed in the making or maintenance of the dies, but where small, accurate parts are to be made in large quantities, special tools for

steel are used. These blocks are either purchased ready forged in various sizes from the steel manufacturers or are forged in the shop where they are used; the former plan being the usual one.

In consulting Mr. Jackson as regards the life of dies he says it would be a hard matter to place even a rough estimate; for though the edges wear off and sometimes crumble they are fullered in and kept in service for a long time—allowance being

A PRIZE CONTEST

From time to time we receive very clever letters from our friends and subscribers—letters full of original thought—some humorous, some grave, all good, pleasant reading. To encourage clean, clever, original letters of this kind we offer prizes as follows:

FIRST PRIZE - - \$50.00 IN GOLD

SECOND PRIZE - A GOLD WATCH

THIRD PRIZE - - A FOUNTAIN PEN

for the cleverest letter accompanying a subscription remittance of one dollar or more and received during 1913.

The letters may be humorous or grave; they may contain kicks or bouquets; they may be written in rhyme or prose—but they must be clean, clever and original, and accompanying a subscription remittance of one dollar or more.

As an example of the kind of letters we want, the following received from Mr. Tom Roop of Ohio is an exceedingly clever one:

Dear Editor Bernhardt:—

Please find enclosed an unfolded sample sheet of Uncle Sam's paper of recent issue upon which you will observe certain figures and pictures, solid valuable reading matter and no fiction. No claim is herein made that this enclosure in weight or intrinsic value equals your yearly enclosure to me, but it is customary for an orthodox subscriber when he has a \$ about his person for which he can find no present or future use to shy it at the Editor's plethoric purse through the mail or by some other artful agency, and against his vicious practice the hapless Editor seems to have no adequate means of self-defense.

Your sympathetic friend,
Tom Roop

P. S. I will surprise myself and take out two years' Christmas.

Get your "funny bone," your "bump of cleverness" and your "dome of originality" to working—make a grab for those fifty round little pieces of Uncle Samuel's favorite product. Get busy now, whether your subscription expires now or later—but get busy, then you'll have your letter ready. Remember—cleverness and originality are the deciding points. The judges will be announced later. The contest closes, December 31, 1913.

both hand and machine use and trained skillful diemakers are needed, as well as a careful selection of the steel used.

Stock for Dies

Steel cast into blocks is not suitable for this work, as flaws or blowholes are likely to develop where least desired or expected, so as a general rule forged blocks of open hearth

made in the shoulder and gutter when the die is first designed—and though they have their troubles at times through breakage of dies he lays it to a streak of hard luck. A rough estimate as to the life of a drop forging die used for medium sized work on Bessemer Steel was given by a foreman of long experience as about forty thousand pieces. Some dies



might be broken immediately when put in operation, while others might stand for a hundred pieces or even more.

Trimming Dies

The dies used in the trimming or stripping press are made of cast iron; the cutting edges of the bottom dies being inlaid with tempered cast-steel plates about one inch thick and from three to five inches wide. A clearance is left on the cutting edges to allow the forging to drop through to a convenient opening in the bottom of the die where the forging may be slipped out. Most forgings require two or more strippings and must be handled very quickly, for if allowed to remain in the dies too long the temper is drawn in the steel plates; rendering them unfit for service. The same caution is applicable to the steel dies of the hammer.

Gray iron castings are used successfully for certain classes of light forgings where the impressions are not too deep or definite and especially for short orders. They are much cheaper; and as the impression can be molded in the die very little machine work is required; but the face and impression itself should be absolutely smooth, and sharp corners eliminated wherever possible. A great deal of work can be performed with cast-iron dies if practically designed and kept properly adjusted. In fact, dies of any material to be used for stamp forging should be kept perfectly adjusted with the key to the dovetail slot on the base block of the hammer; not only to insure the life of the dies, but to insure a perfect forging.

Description of Dies

In giving a description of dies I know of none better than that of C. W. Shelly:

"Drop forging dies are made of 0.45 to 0.60 carbon steel and are usually from five to eight inches thick. The dies are marked "T" and "B" (top and bottom), to prevent their getting mixed in the laying out. The front and left hand sides are squared up, and from these sides the center lines of the impressions are laid out and the dies set up when ready for use. The edge or breaking down impression is on the right hand side of the die. It is used for breaking down the rough heated stock into something like the required shape before it goes into the finishing die.

The heaviest part of the forging is always nearest the front. In deep dies, shapes which show parallel sides on the drawing are given from 5° to 7° taper on each side to prevent the forging from sticking in the die. For machining, 1-32 inch is usually allowed; and for shrinkage, 0.012 to 0.015 per inch. When the dies are finished a specimen casting of lead is made in them to ascertain whether or not they will give the desired result.

"The edger or breaking down form on the right of the die is made from 1-16 to 3-16 inch smaller than the horizontal cross section of the forging and has no abrupt shoulders or curves. The idea is to get the heated stock smaller in width than the finishing impression; so that the bottom of the impression strikes the stock first and spreads it to the sides filling the die. Cast-iron dies are also used for breaking down heavy work.

"The flash, which is a recess 0.015 to 0.025 inch in depth and about 7-8 inch wide, milled around each impression, allows the surplus stock to escape from the die. This surplus is afterwards trimmed off in the trimming dies. The top die also has a groove about 1-16 inch in depth milled around the impression, 1-4 inch from the edge. The gate for clearing the stock tapers gradually towards the front from the impression; so as not to weaken the die at that point.

"In dies for making small forgings in large quantities there are several impressions sunk; one of which is used for a rougher and should be about 1-32 inch narrower and deeper than the finishing impression. Some dies have to be interlocked when difficult shapes are to be forged; that is, the faces have to be shaped to suit the offset in the forging. Care must be taken to have the interlocking parts high enough so that the dies will not glance off when striking the stock and make an imperfect forging.

"When the faces of the dies are curved, special cutters are made for surfacing and flashing. As a guide for machine curved impressions some mechanics transfer the lines to the side of the die blank and lay out the curve there, then clamp a surface gauge on the profiling machine, and with the needle set to the face of the cutter work out the stock by following the lines with the needle point.

Dies for forging gears or similar work are finished with a broach having the teeth machined in it, which is then driven into the die."

Opportunities

Here are listed a number of live opportunities for live blacksmiths—towns and localities where blacksmiths are needed. If you want to start anew and if you have the necessary energy, skill and perseverance to stick to business until business sticks to you, get into touch with these business chances. Unless otherwise stated under the opportunity listed, write to the Commercial Club of the town for full information.

MARCELLUS, WASHINGTON (Adams Co.)

This is a new town in a wheat growing district that is rapidly filling up with thrifty farmers. This will make a good town and there is an opening now for a blacksmith.

MARTINSDALE, MONTANA (Meagher Co.)

Population 150. Situated in excellent wheat country. The town now has two hotels, two large general stores, a school, a church, and there is a good opening for a blacksmith shop.

MONTAGUE, MONTANA.

A brand new town in an excellent farming and fruit section. There is said to be an excellent opening for a blacksmith.

MCLAUGHLIN, SOUTH DAKOTA (Corson Co.)

Population 150. On reservation. The surrounding country is rich, rolling prairie that is settling rapidly. A blacksmith will find a good opening here.

OTHELLO, WASHINGTON (Adams Co.)

Population 500 and rapidly increasing. Located in center of large farming district. The climate is said to be exceptional—cool nights in summer and invariably mild winters. The town has banks, hotels, churches, schools and a city water system, and an electric light system will be installed. There is a good opening for a blacksmith, a foundry, a wagon shop, cement block factory and a hardware store.

PLEVNA, MONTANA.

A new town in a new farming section of Eastern Montana. There is said to be a good opening for a blacksmith here.

REVERE, WASHINGTON (Whitman Co.)

This town is in a new territory just opened by railroad facilities and promises to be an important point. Wheat houses are now being erected to care for a 200,000-bushel crop. A blacksmith will find a good opening here. A machine shop and implement dealer are also needed.

RYEGATE, MONTANA (Meagher Co.)

This is a new town in the center of the Musselshell Valley. It was established in 1909 and now has a number of good stores, a bank, a restaurant, a hardware and machinery business, a lumber yard, a livery, a lodging house, a hotel and a weekly



paper. A good general blacksmith will find a good opening here.

SANGUS, MONTANA (Custer Co.)

This town is located in the Yellowstone Valley, twenty-six miles from Miles City. This district was formerly included in the Montana sheep range, but for the past two years good crops have been raised here without irrigation. A blacksmith is always needed in newly developed country.

STRAW, MONTANA (Fergus Co.)

Population 100. This town has an elevator, a general store, a blacksmith shop and several other business establishments, but is in need of a wagon repairer.

THORP, WASHINGTON (Kittitas Co.)

Population 200. Located in a part of the famous Kittitas fruit belt. The section is settling rapidly and this town should become an important point. There is said to be a good opening for a blacksmith, sawmill and a harness shop.

THREE FORKS, MONTANA (Gallatin Co.)

A population of 1,200. This town is about 4,000 feet above sea level; giving it an excellent climate. It has excellent churches and schools and cement walks. An electric railway connects to Bozeman. While most businesses are well represented in the town, there is said to be excellent openings for another blacksmith, an implement dealer, a cement block factory, a wagon shop, a painter, a harness shop.

TWODOT, MONTANA (Meagher Co.)

Population 250. In the upper Mussel-shell Valley in a fine farming and grazing country. The town now has a bank, general stores, a grain elevator, lumber yard, school, churches, hotel, opera house, etc. There is a good opening for a blacksmith here.

WAKPALA, SOUTH DAKOTA (Corson Co.)

The present population is about 200—mostly Indians. It lies within an Indian reservation which will soon be thrown open to the public. The town now has a bank, a general store, a restaurant and a small hotel. At present it needs a blacksmith shop.

WARDEN, WASHINGTON (Grant Co.)

Population 350. Situated in a splendid farming and fruit section. The town now has general stores, lumber yards, churches, a hardware store, furniture store, bank, newspaper and school. There is said to be a good opening for a wagon shop, a machine shop and a foundry.

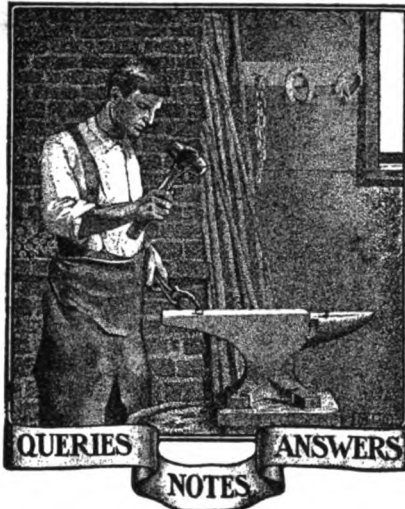
WESTMORE, MONTANA (Custer Co.)

A new town in the dry farming region of Eastern Montana. It presents a good opening for a blacksmith, also a harness shop.

ASHFORD, WASHINGTON (Pierce Co.)

Population 200. This town seems to have an excellent future. It is the railway station for Mt. Rainier National Park. It is in the center of a fine agricultural section and there are large coal and timber developments here. There is a good opening for a blacksmith.

NOTE—We are indebted to the Industrial Dept. of the C. M. & St. P. Ry. for the above information. Inquiries regarding the above opportunities may be addressed to the Department at their Chicago office.



A Query on Axle Setting.—I would like to ask through the columns of "Our Journal" the best method of setting small axles, from $\frac{3}{4}$ to $1\frac{1}{4}$ inches. What is the best gauge to use? Will some brother smith please answer this?

J. T. SOAPES, Tennessee.

Wants a Trip Hammer.—Can you give me description of, and directions for building, a trip hammer? My main work in summer is plow work. Is a $1\frac{1}{2}$ horsepower gasoline engine large enough to pull a light hammer?

VIRGIL JENKINS, Missouri.

Weldarline in the Forge.—Can Weldarline be used in a blacksmith forge (using coal) with success, and what is the proper way to use it?

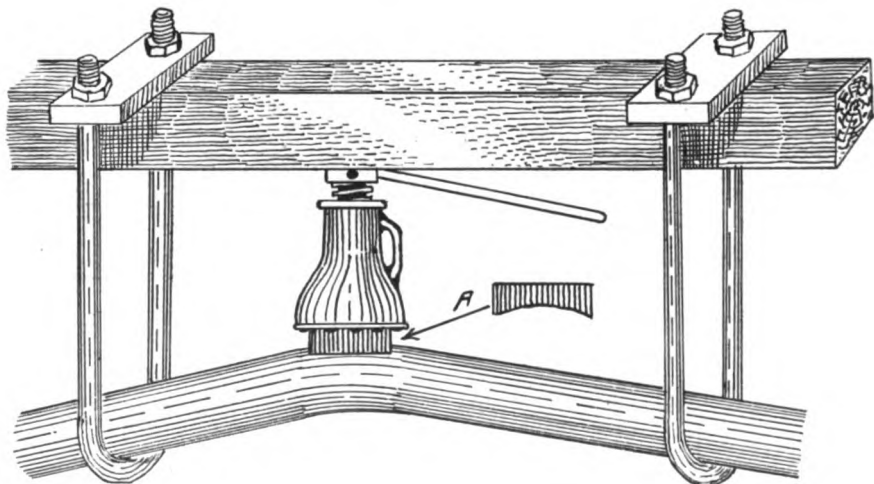
C. M. TAYLOR, Missouri.

In Reply.—If Mr. Taylor will communicate with the Weldarline Mfg. Co. of Topeka, Kansas, they will advise him fully regarding their product and how to use it.

A. E. G., NEW YORK.

To Straighten a Large Shaft.—In the March AMERICAN BLACKSMITH, J. A. Graham tells how he straightened a large piston. I will explain a better method, I think, and one we use when occasion demands the straightening of a large shaft. The illustration will show how we "rig up" for a job of this kind. We would heat slowly, just as Mr. Graham does, then when hot, place jack in position and unscrew same. By this method the shaft can be made almost perfect and will not be sledged or upset after straightening.

J. C. LAMON, Tennessee.



Blisters in Veterinary Practice.—Please find enclosed postal order for £1 for five years' subscription. I can assure you that I look forward to this interesting and valuable paper every month. I am interested in the trade in several branches and read with interest the articles written by men of practical experience. Would like to know exactly the contents of blisters and how they are made up (both the liquid and paste blisters) and how used. We read of applying a blister for a defect, but are not advised as to what it is made of and how often applied. The bar-shoe is one of the best shoes for all ailments; with a rolled toe for comfort.

CHAS. R. OLIVER, So. Africa.

Working Overtime.—Here is a question which I would like to ask some of the other readers of the paper:

Is the customer adapting himself to the convenience of the smith or is the smith adapting himself to the convenience of the customer? For instance, the customer will tell you that he will be in "tonight" to get his team shod; not considering whether or not it will be agreeable to the smith to do the work at night. If the smith refuses to work after a certain hour the work goes to another shop. We are not at liberty to tell them when to come in to have their work done, but they tell us when they are coming in. I would like to know how many others experience this unreasonable demand on the part of customers, and how they deal with cases of this kind.

ALBERT MEIER, Pennsylvania.

Sharpening Discs.—I see by the April number that Mr. Swope advises Mr. Challen to get a grinding machine for sharpening discs or, better still, to get a machine that takes a whole section at once.

Now, I believe Mr. Swope's experience must be very limited; as I can take a Monarch, and with the assistance of a helper can sharpen more than twice as many good, hard and rusty blades as Mr. Swope can, on either machine he speaks of. I am so positive of this that I will give him twenty-five dollars and carfare if I don't do it, and I will let him have a helper, but he must do as good work as I do.

I can sharpen more blades in a given time than any roll machine on the market.

C. M. STRAIN, Iowa.

A Letter from Tasmania.—THE AMERICAN BLACKSMITH is as welcome as a spring shower in an out-of-the-way place like this; I would not presume to suggest any alteration in the printed matter contained in it.

In this place, plow work and auto work are not called for. We are situated in the



heart of a mountain range, and the only means of getting supplies and mail matter is by a line of railway which crosses the range at an incline of one in ten. It is only negotiable to specially constructed engines with a gear wheel which runs on

any better engine made for the shop.

WM. DONALDSON, Oklahoma.

Doing Work for Spot Cash.—I want to say a few words about the blacksmith business in this part of the country. I don't know much about the trade in the East,

before he expects to pay for it. My circumstances are such that I cannot afford to carry long-time credits."

The money end is the main part of the business. The days are long and the work is hard and I think if we could all get together and get our trade and prices established in a businesslike manner it seems as though we could move the Rocky Mountains. If you have a customer who is always in arrears, cut him out—you don't want his trade. If he hasn't enough respect for himself to pay his debts he is nothing but a deadbeat.

Two years ago I carried one customer 'most all summer; he said he was hard up and kept promising me from time to time. Finally I got tired of waiting for him to pay and I told him that he would either pay the money to me or to the Justice of the Peace. He said he was capable of paying his debts and would give me a check. He said he had the money in the bank all summer, but he was afraid he might lose one of his work horses and would have to buy another. That is what started me for the cash plan. I wouldn't be surprised but that there are others of you carrying over men who are worth a great deal more than you are.

The sooner the cash plan goes into effect the sooner the poor man will better himself. Think this over and see if there isn't a little truth in it. I hope the Editor of this paper will keep after the craft and the smiths who have started on the right road and encourage all smiths to get cash for their work. Prices should be in accordance with conditions; you can afford to work cheaper in some places than in others. I charge to suit myself, but I charge every one alike, and I have more friends and customers since I have gone into the cash plan. I have a fine trade in this little town and get good prices. I do everything that comes to my shop in the shape of repairing and general blacksmithing.

There are no young men learning the trade in this part of the country; they seem to consider the trade beneath them. But the time is here when a good, all-around smith is his own boss and can get all the work he wants in any place.

I have one more word to say, and that is to treat your customer as you would like to be treated—but don't let him impose upon you. In justice to yourself, see that you are paid for your labor.

F. H. McARTHUR, Kansas.



MR. JOHN ARMSTRONG HASN'T ALLOWED THE AUTOMOBILE BUSINESS TO GET AWAY

a rack rail laid between the ordinary rails.

I have the only smithing business in a town of 5,000 inhabitants. Prices are good; shoes, sizes 1 to 6, 7 shillings (\$1.70); draught horses, 9 shillings (\$2.19); resetting, 4 shillings (\$.97); tires, (all heavy) setting, 15 shillings (\$3.65); per new setting, 1 3/4 by 3/4, £2 (\$9.73) and up.

C. H. STIRTZ, Tasmania.

A Well-Equipped Illinois Shop.—I am sending you a picture of the outside of my shop, and also the inside view, for the paper. My shop is 44 by 60, two stories, as you will see, with concrete floor, electric lights and power. I have a 5-horsepower motor for power and also have an electric blower. I run a trip hammer, a disc sharpener, a rip saw, a lawn mower grinder, an emery stand and polisher, a horse clipper, a clipper knife sharpener and a drill. I also have an elevator to take rigs upstairs when we do painting, upholstering and rubber-tire work. We have a good trade in the general line.

JNO. ARMSTRONG, Illinois.

The Tire Question Settled (?).—I would not do without THE AMERICAN BLACKSMITH for anything; there is always something new in it for the "old boys." I have been in the trade for thirty years, but I can always learn something from "Our Journal."

Now I want to tell the boys how I work to please the people: I have a Brooks' cold tire setter and an Ideal hot tire setter. If they want their tires set cold I tell them that is the only way; and if they want them set hot I tell them the same; but, between you and me and the gatepost, if I had tires to set for myself I would set them?—This is still a debatable question.

I also have a Little Giant trip hammer which is just the thing for sharpening plows, road graders, pointing shovels, welding buggy axles, etc. I also have a drill press and an emery stand.

We run a garage in connection with the shop, and it is equipped with a lathe, tool grinder and air pump. All of this machinery is run by a little 4 1/2 horsepower Olds gasoline engine, and I don't think there is

but I should think that it would be about the same as it is here in the Middle West. I have been a smith since boyhood, and I am going to tell you about my experience in this line of work. I think smithing is as good as any other trade, provided a man goes at it in the right way. There are too many of us who allow the customer to tell us when he will pay for the work. It has been done with me, and from what I read and hear about, it is being done everywhere. I have cut it out. They don't tell me who is boss any more, and I consider that it is the best thing I have ever done. In 1911 I crowded my accounts to the utmost, and in 1912 I crowded my collections closer still, and on January 1, 1913, a sign reading as follows went up on the wall:

"Take Notice—Blacksmithing, Cash Starting Jan. 1, 1913, I will work for cash only, unless otherwise arranged. Every man expects his work completed



THE INTERIOR OF MR. JOHN ARMSTRONG'S SPACIOUS SHOP, OF ILLINOIS



TIMELY TALKS WITH OUR SUBSCRIBERS

The American Blacksmith is published monthly at The New Sidway Building, Buffalo, N. Y., U. S. A., by The American Blacksmith Company, Incorporated under New York State Laws. Entered, February 12, 1902, as second-class mail matter at Buffalo, N. Y., Act of Congress, March 3, 1879.

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Subscribers should notify us promptly of non-receipt of paper or change of address. In the latter case it is necessary that you give us both the old and the new address.

Oxy-Acetylene Welding

That article in the May issue by Mr. Waychoff created so much interest and there were so many requests for additional information on the subject of oxy-acetylene welding and cutting that we are publishing another article by the same author.

In this new article Mr. Waychoff tells just how to build an improved oxy-acetylene plant—how to make a torch or blowpipe—how to use the outfit and do the work—how to make and use a cutting outfit—how to equip the shop for welding and cutting, and how to make a preheating outfit. This new series by Mr. Waychoff will present many new features of this work and will give our readers at least an idea of the possibilities of an oxy-acetylene outfit.

Association Meetings and Picnics

Association picnics, outings and excursions will soon be the order of the day, and these are just the times and places for bringing up the matter of club subscriptions to THE AMERICAN BLACKSMITH. Bring the matter up at the next meeting. There are several ideas that can be carried out successfully and at little cost. Ask for suggestions as to how THE AMERICAN BLACKSMITH can aid you in your association work, in establishing better prices, in securing better recognition of your services.

The work of THE AMERICAN BLACKSMITH in educating the craft and encouraging its members to become better business men, better workmen and to get better pay, should have the co-operation of every association in the country.

Write for suggestions today. Our price to associations will surprise you.

Subscription Agents

When a stranger solicits your subscription to THE AMERICAN BLACKSMITH, or any other publication, insist upon his showing you absolute proof that he is an agent in good standing and is employed by the publication which he represents. Don't, under any circumstances, give the man your money if you are not sure that he really works for the paper he says he does. No matter what the man offers you—no matter what price he makes—no matter what premium he promises to send—DON'T GIVE HIM YOUR MONEY IF YOU ARE NOT SURE.

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This Issue

This issue is our Annual Shop Number. We have endeavored, with the aid of "Our Folks", to make it the best issue we have yet placed before you. How we have succeeded is for you to say. And we heartily wish that every one of our readers will tell us just what he thinks of this number.

We have endeavored to make this number a Shop Number not only in name but in the heaping full measure of its contents as well. We have aimed to give you such information, such articles, such hints, kinks and formulas as will make the shop work easier, as will make the work in the shop more pleasant, more profitable and better in every way.

When you have read this issue, when you have carefully digested the articles, just drop us a line and tell us your thoughts. Kick if you think we deserve it—hand us a bouquet if you think we deserve that. But do, please, write.

Who Knows It All?

Were a man to live a thousand years and to study all his time he could not learn all there is to blacksmithing. And yet some men in the craft say they cannot learn anything new from their brother craftsmen. They seem to think their training exceptional—they seem to think that there are few, if any, changes being made in the craft, and they seem to think that they, themselves, can keep track of those changes.

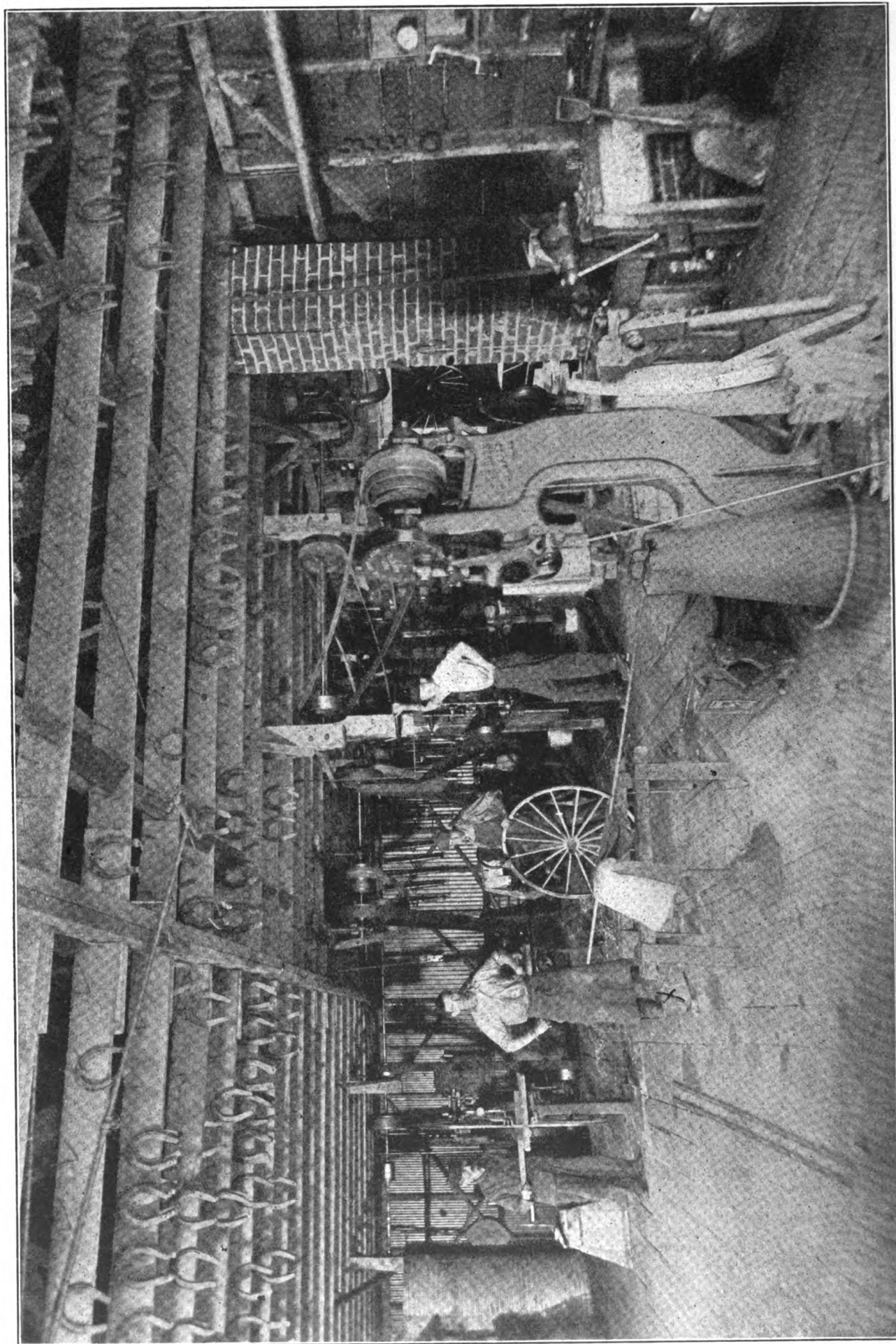
Then, again, there are veterans who have grown gray beside the forge and behind the anvil. There are men who have retired, who have taken off their aprons and laid down their hammers—men who began under father's and grandfather's guidance to pump and pound, and have done nothing else for their three score and ten. And these veterans admit that in all their lifetime, supplemented with the training and knowledge handed down by fathers and grandfathers and great grandfathers, they have not learned all there is to the craft. They admit that new matters are being brought to their attention every day.

As one smith up in Ontario says:

"Some may 'know it all,' or consider they are too old to learn, but I always listen to the other fellow and look to THE AMERICAN BLACKSMITH."

FRED. SPRINGER.

Do you think it possible for one man or two men or fifty men to know all there is to blacksmithing?



THIS WELL-EQUIPPED POWER SHOP DOES ALL KINDS OF GENERAL WORK. MR. FRED. E. DETWYLER RUNS THIS WEST VIRGINIA SMITHY



Some Unusual Blacksmith Shops

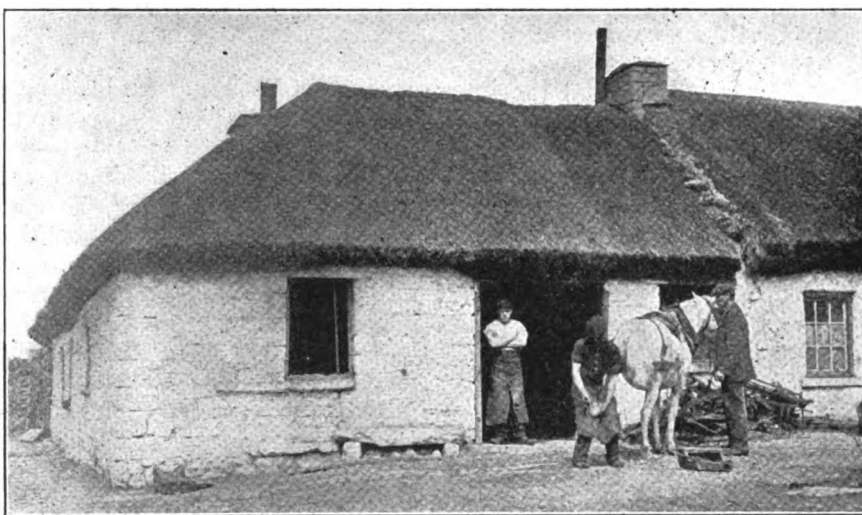
WALDON FAWCETT

IT IS doubtful if there can be cited an institution that is more "universal" to the entire civilized world than the blacksmith shop. In all lands and climes, whatever be the occupation or habits of the people or their favorite modes of locomotion, we find the blacksmith shop seemingly indispensable. Indeed, globe-trotters who have been observant on this point have had it impressed upon them that even in isolated settlements which lack such supposed standbys as a church, a schoolhouse and an inn or hotel it is not unusual to find a blacksmith shop;—tangible proof that the place is up to date in some respects at least.

Not less remarkable than the universality of the blacksmith shop is the fact that so large a proportion of blacksmith shops, not only in widely separated localities in the United States but also in foreign countries, differ but slightly in their main characteristics. To be sure, the architecture of the shop may be very distinctive, and so likewise may be the costume of the blacksmith, but it is surprising how large a share of the shops conform to world-wide stand-

ards in the main essentials. In few cases does the casual tourist fail to identify a blacksmith shop at first glance. All the same, there are scattered here and there in the two hemis-

form work not usually associated with the functions of a blacksmith shop. Indeed, it is doubtful if many of the men in the trade have any conception of what a versatile business is



A CHARACTERISTIC BLACKSMITH SHOP IN IRELAND

phers a goodly number of more or less unusual blacksmith shops. Some of them are novel in setting and environment, whereas others are unique by reason of the fact that they per-

this one which has been immortalized in poetry, painting and music as well as in the matter-of-fact business chronicles of several centuries.

Naturally enough, many of the blacksmith shops which to American eyes appear most unusual are located in foreign countries. For instance, in our neighboring republic of Mexico, which has lately been so much in the public eye, one sees many odd blacksmith shops. In some of the cities, particularly those near the boundary where American methods have displaced the Spanish, the shops are modern enough, but in the smaller and more remote settlements it is exceptional to find anything except such tools as were in use by American blacksmiths half a century or more ago. In not a few of the less pretentious shops the tools, such as cold chisels, punches, tongs, etc., are all made by the workmen themselves and are not much for looks. Many a Mexican blacksmith makes not only



THE ARTISTIC SMITHY OF MR. J. E. SKINNER OF KENT, ENGLAND. ALL THE WOODWORK OR TIMBERING IS OF OAK



THE AUTOMOBILIST CALLS THE BLACKSMITH TO HIS AID

his own tools but also all the iron shoes required.

Some of the most picturesque blacksmith shops the writer has ever seen are those located in the Emerald Isle. The trade in this locality is a thriving one, Ireland is pre-eminently an agricultural and grazing country; there is an immense amount of driving; and there is considerable work required to keep the steeds properly shod and the vehicles in condition for service. The Irish blacksmith wears no distinctive costume, but the white walls and thatched roof of his shop and the enlivening wit of the worker cannot fail to fix themselves in the memory of the stranger in the Land of the Shamrock.

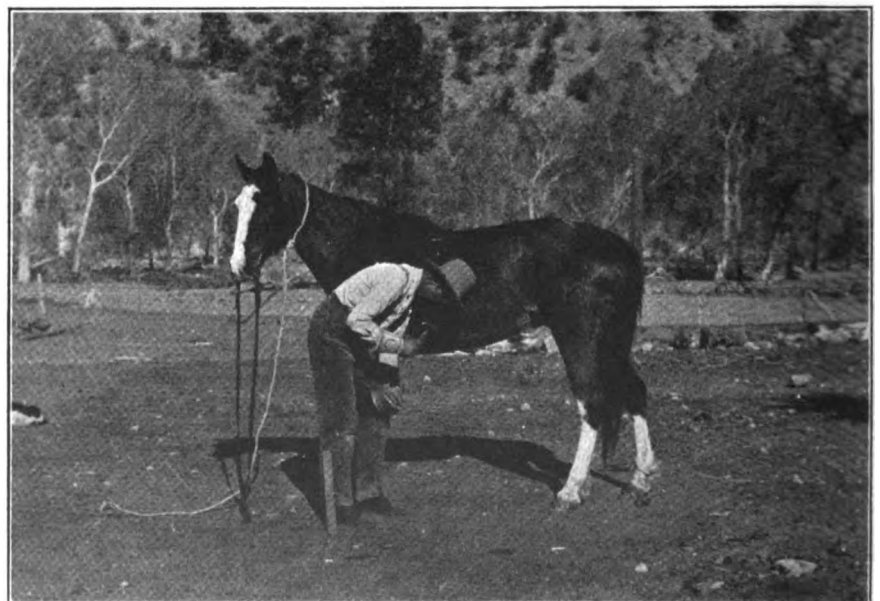
Up-to-date blacksmith shops in an interesting environment are those on the Isthmus of Panama. Uncle Sam has had, of course, to establish large blacksmith shops of the kind common in big industrial plants in the United States to keep in repair the equipment used in digging the canal; and in many instances this repair work has been very arduous, for it is no slight chore to replace parts and put in condition one or more steam shovels that have been buried under a slide in the Cut. Moreover, this repair work must almost invariably be carried on as a "rush job", in order that the shovel or other machine can be put back into commission as quickly as possible. In addition to these model industrial blacksmith shops at the Isthmus there are a number of the ordinary variety;—six in Colon alone. They all have American equipment and use supplies from the United States.

Many of the European blacksmith shops appear truly diminutive to the person accustomed to up-to-date American shops. This economy of space is possible because, in many instances, the shop is little more than a storehouse for tools. In Russia, for instance, the blacksmith does practically all his work in the street in front of his shop. Some of his practices would cause his arrest in many an American community, for obstructing the traffic. The traveler in certain European countries, notably Switzerland, can scarcely fail to be impressed with the extent to which the magic electric current has been adopted for power purposes even in the smaller shops. It is said that in many places it is almost impossible

to induce a blacksmith to operate a forge where electricity is not available to perform the work formerly left to the bellows.

Probably the most unusual blacksmith shop in Europe, if not in all the world, is located in Paris. Its sole output consists of "properties" for use in the production of grand opera. In these days when a fortune is expended to mount a production at any one of the world's grand opera houses there is a demand that many of the metal objects introduced shall be the real thing and not imitations, and this provides the market for the output of this unique shop. Although the product is thus limited to stage hardware, the shop employs six or eight men, and several fires are usually kept going. The blacksmiths must be masters, too, of their special craft, for they are liable to be called upon at short notice to produce anything from a sword of the ancient Egyptian type to a stand or pedestal for an electric "spotlight."

The Balkan war may possibly provoke some curiosity on the part of American blacksmiths as to shops in Turkey and the methods of workmen in the trade in southeastern Europe. Many of the shops, it must be admitted, are pretty primitive affairs, and horseshoeing as an art shows little development, for all the horses to be looked after are the splendid Arabian steeds that are famous everywhere. In some parts of the near east the horseshoer does no blacksmithing, and the blacksmith, in



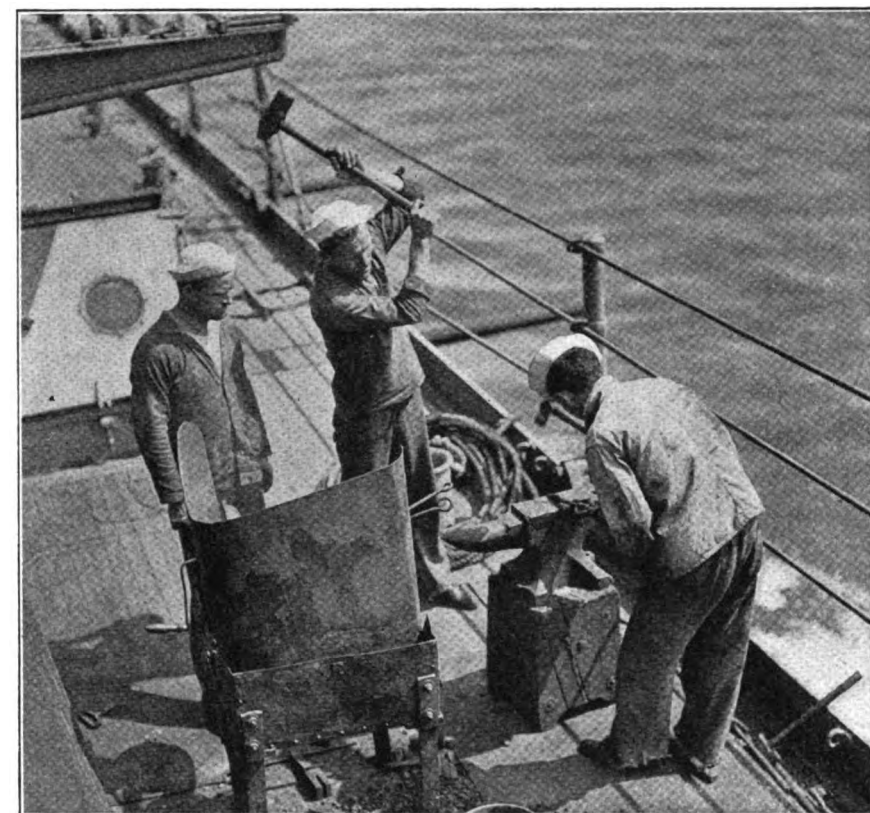
ONE OF UNCLE SAM'S HORSESHOERS PUTTING NEW FOOTGEAR ON THE HORSE OF A FOREST RANGER



turn, does little or no horseshoeing. Where there is such a division of jurisdiction the blacksmith shops are usually much superior in fittings and equipment.

Some of the most unusual blacksmith shops to be found anywhere are those maintained by the United States Government; and it would surprise the uninitiated could they be shown how very extensive are Uncle Sam's interests in this field. Why, it has even come to the point where the Federal Government finds it necessary to employ blacksmiths to look after the vehicles and the shoeing of the horses employed in the conduct of the public domain;—for instance, the rangers, etc., who patrol our National Forests; the guardians of our National Parks, etc., etc.; or to jump from the practical to the theoretical it may be pointed out that the U. S. Department of Agriculture has conducted extensive experiments to gain material for the books which it has issued for the benefit of farmers on such subjects as horseshoeing and blacksmith work in the repair of farm equipment.

But the most novel as well as the most numerous governmental blacksmith shops are those in the Army and Navy. Every fort or military post where cavalry or artillery forces are stationed now has its own blacksmith shop and so likewise does every modern warship. It is nothing short of astonishing how much blacksmith work there is constantly to be done on a first-class battleship, but it must be borne in mind that a

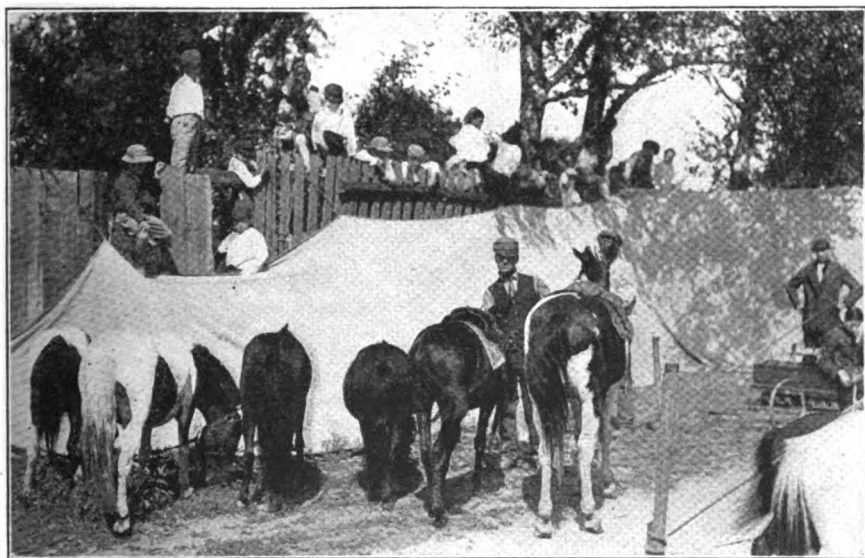


NAVY BLACKSMITHS AT WORK ON THE DECK OF A BATTLESHIP

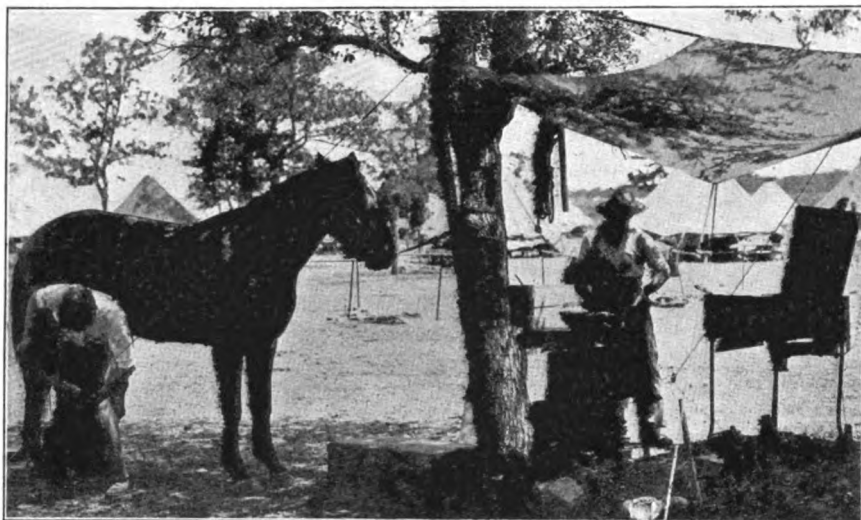
twentieth-century sea fighter is nothing more or less than a huge floating fortress of solid metal construction; and every alteration, every change or reconstruction and every repair job of minor character is more likely than not a task for the blacksmiths. There are several blacksmiths on every first-class battleship, and Uncle Sam provides them with the very best equipment, including portable forges of the latest approved models.

The blacksmiths in the U. S. Navy are paid at the rate of \$55 per month, but in comparing this with a blacksmith's earnings in the commercial field it must be borne in mind that this \$55 per month is net. That is, Uncle Sam supplies the blacksmith on shipboard with free board, lodging, clothing and medical attendance. He has his \$55 per month, clear, and there are certain emoluments for long service, etc. Many a blacksmith has saved up sufficient money during one or more terms of enlistment to establish himself in a well-equipped shop of his own when he has retired to private life. The opportunities are much the same in the military arm of the service, although perhaps the blacksmith does not derive quite the all-around experience of his craft that comes to the man in the blacksmith shop afloat, but it must not be inferred that the only responsibility is horseshoeing. There is frequent necessity for repairs to gun carriages, transport wagons, etc., which are, of course, subjected to very rough usage in drill and maneuver work.

Blacksmith shops that are decidedly out of the ordinary are those attached to the great traveling circuses and Wild West Shows which we



WAITING THEIR TURN OUTSIDE THE CIRCUS SHOEING SHOP



SHOEING SHOP AT AN U. S. ARMY POST. SHOEING GEN'L CARTER'S HORSE

claim as a distinctly American institution. It requires no vivid imagination to form an idea of the manifold duties of a circus blacksmith. The big, tented show carries 300 to 400 horses, and there is no class of vehicle that is subjected to more wear and tear than the heavy circus wagons. A big show such as the Barnum & Bailey or the Ringling circus usually carries not less than three blacksmiths; and their tent with its portable forges and other modern equipment is almost the first canvas to be erected upon the arrival of the show in the morning and is one of the last to be taken down at night.

Probably the local blacksmith operating his own shop or acting as helper in a small shop never gives a thought to the great blacksmith shop which has gradually grown into a stable position as the accepted adjunct of the big industrial plant, and yet it is in no small measure the market afforded by these elaborate blacksmith shops that is responsible for that spirit of invention and development which evolves the highly perfected blacksmith equipment which benefits all blacksmiths. Just as an illustration of what the big industrial blacksmith shop signifies there might be cited the equipment of the shop at our largest American shipyard, located at Newport News, Va. This particular blacksmith shop is 300 feet in length by 100 feet in width and employs 175 men. The regular equipment of anvils ranges from 250 to 400 pounds each, but there are two 3,000-pound anvils made specially for this plant. There are one large and two small forge fur-

naces and fifty forge fires. As for steam hammers, there are three 600-pound hammers; three 800-pound; two 1,100 pound; one 2,500 pound; and one 3,000-pound.

From the Gold Mines of New Zealand

W. T. WILSON

This is a small gold mining township about 2,000 feet above sea level and 100 odd miles from Dunedin, the principal city of this district. Like most all gold mining centers we are going back every year; as there is nothing else to fall back on—very little agricultural land—mostly pastoral.

I run a *one horse* shop; very seldom have any help except for odd jobs that one man can't do. Horseshoeing and general repairs is the bulk of my work, with a little woodwork, such as making wheelbarrows, thrown in. I also make a few pressure pipes for claim use, but not many nowadays. I have no power in my shop. I have a pipemaking plant all worked by hand.

Prices here are fairly good, but they would need to be; as railage and cartage are very high. I am twelve miles from the railway and get 7s. (\$1.70) for a set of hackshoes; 8s. (\$1.94) for spring-carters and 9s. (\$2.18) for draughts. All plain shoes except the draughts, which have heels but no toes.

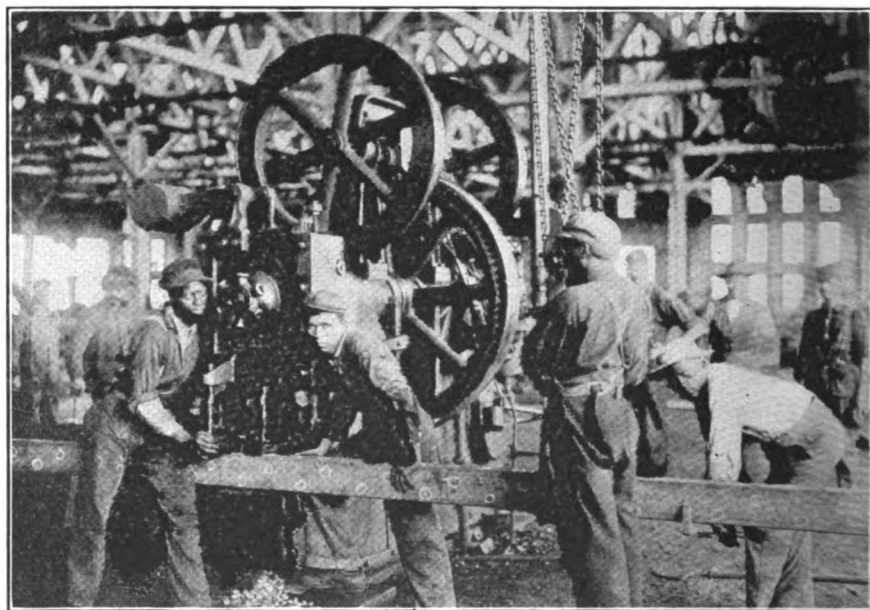
The nearest shop is twelve miles away on each side of me. I look forward with great pleasure to getting **THE AMERICAN BLACKSMITH**. Although I live in the backblocks and am sort of out of the "hurly-burly" I enjoy reading it all—indeed I read every word in it, even to the advertisements.

American methods are very different from out here, especially in shoeing, but I think principally in winter shoeing.

A Shop Crane for Handling Heavy Material

F. G. REISTER

About the handiest thing we have in our shop is the crane which we put



IN THE SMITHSHOP OF AMERICA'S LARGEST SHIPYARD AT NEWPORT NEWS, VIRGINIA



up about a year ago. The engraving shows the handy arrangement so well that little explanation is necessary. We handle all kinds of heavy articles with it, and the crane in connection with a heavy, flat bed truck is used in removing motors from automobiles.

The cost of putting up a crane like this is very low. The crane arm was originally a two-inch rod which we purchased as scrap from a factory. This rod was bent at right angles at one end and an eye and then a bend made on the other end. Then we took a piece of flat stock, one inch thick by two inches wide and six inches long, and fitted it to the crane arm as shown at A in the engraving. One end of this six-inch piece is fitted to receive the crane arm rod, while the other end is grooved to receive the brace rod. This rod was a stout steel wire threaded at both ends. These threaded ends pass through small holes in the crane arm and are held in place by nuts, which also operate to tighten the brace rod.

The brace at B is a solid rod, though a stout cable or heavy wire would do as well. The method of attaching this brace is easily seen. It is tightened by means of the nut and eyebolt at CC. A similar eyebolt and nut support the wall end of the crane arm. A washer at D and a flat cotter make it impossible to lift the crane arm out of the supporting eye when no load is being carried.

The pulley and hoisting device are easily understood from the engraving. A pulley wheel at E by means of the clevis, F, supports the hoisting tackle. The hoisting tackle is the only part we purchased new—all other parts we either had in the shop or, as in the case of the crane arm, we secured it very cheaply. In buying a hoisting tackle, get a tackle fitted with a locking device, so you can raise your heavy articles to any height and leave them without tying the loose end of your rope all around a post or the anvil block.

We would not exchange our crane for a sum equal to three times what it cost if we could not get another. It saves lots of hard work.

Who Is To Blame

H. N. POPE

Who is to blame in the case of the man or the horse being injured? While I know my opinion will not



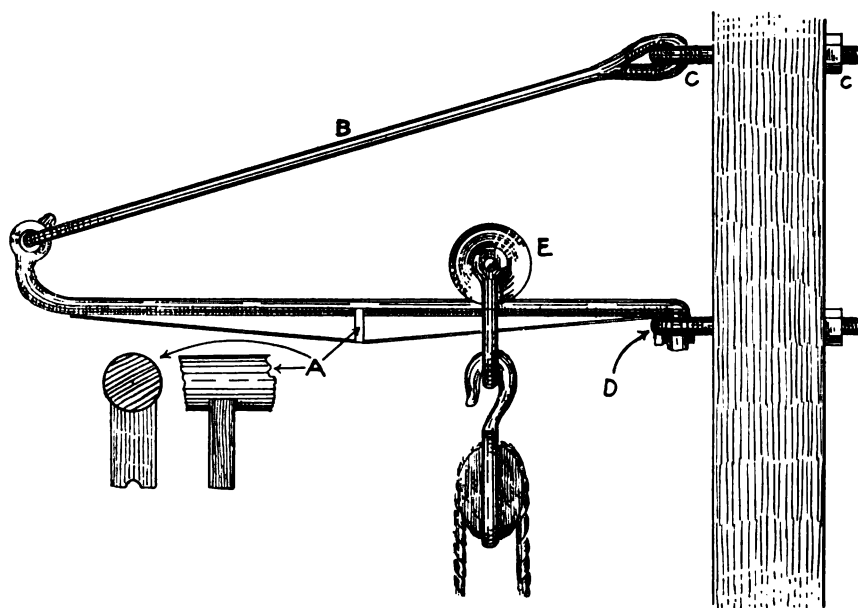
FRENCH BLACKSMITHS WHO SPECIALIZE IN STAGE PROPERTIES

be approved by the craft in general, it does not alter it, just the same. I believe, in most cases, haste and want of care is the main cause. For example: Take the case of a young man fitting a shoe on the hind foot of a horse. He rushed from the fire to the horse, grabbed up the foot, slapped on the shoe, saw where it needed changing, dropped the foot from his knee and started for the anvil. About this time the horse awoke to the rough usage it was getting, let drive, caught the man in the back of the head and laid him dead on the floor.

Now I say, again, it was the man's own fault. If he had dropped the foot quietly, stood up beside the horse and walked to his fire I do not think an accident would have occurred.

Again, a man is injured, in being kicked by the horse next to the one he is working under. I say, want of care is the cause. He should have seen to it that he was far enough away to be out of reach of any stray kick.

Now, as to who should foot the bill? I believe when a smith opens a shop to the public he opens to all comers and takes his own risk. As to the injury to the horse I can conceive of no way to injure him unless a rotten floor gives way. Then I would say it was up to the man who ran the place. That would be liable to happen only at Tom's, and one should expect such things to happen if they patronize him. Let me say again, the fault lies with the man doing the work and to the rush and want of proper precaution.



A SHOP CRANE FOR HANDLING HEAVY MATERIALS



The Forge

Why It Does or Does Not Work Properly
M. G. WILLIAMS

The forge is such an important item of equipment in the smithshop—in fact, it is *the* important piece of shop “machinery”—that one would naturally suppose the smith would make a study of forges, fires and draft. But the smith who knows all about even his own particular forge is an exception. There are so many matters to be considered in the proper working and operation of a forge that it may be well to review these matters very carefully.

In the first place, when installing a forge we must bear in mind that mistakes in installation can be remedied only at considerable expense

is very likely to “draw” the wrong way.

Then, too, there is the neighboring building to consider, also the nearness of any tall trees. All these factors must be carefully considered in the erection and completion of a chimney that is to draw well.

Then there is the size of the flue. It must be understood that a flue is only as large as its smallest diameter. For example, a flue 8 by 4 at the forge and reduced to 6 by 4 at the roof, may be enlarged to 8 by 4 in the chimney above the roof, still the capacity of the flue can be measured by its smallest diameter only, i. e., 6 by 4.

This same fact applies whether the flue is partly made up of stove pipe or is all of brick. If stove pipe is used to carry the smoke from the

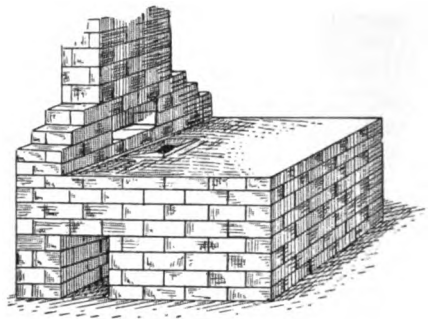


FIG. 2—A SIMPLE BRICK FORGE

A hood, if the forge is a brick one, will help to keep the shop free from smoke and soot, and if the hood is made removable it will not be in the way when large work is being heated. Of course, the portable forges and the cast-iron and sheet-steel forges now made are already properly planned by the manufacturers, and the only points the purchaser of one of these forges has to arrange is proper sized piping and a correctly built chimney.

The brick forges shown in the engravings are not intended or recommended as being better than metal forges, but simply as properly proportioned and designed brick structures.

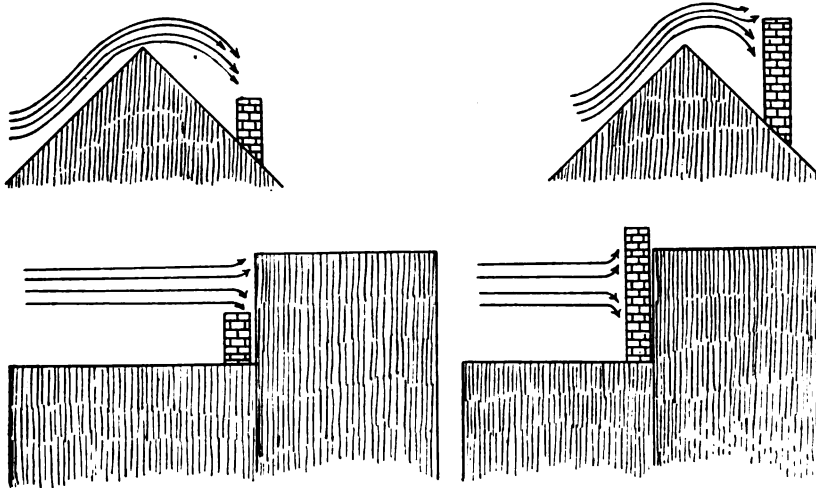


FIG. 1—SHOWING HOW THE SHORT CHIMNEY AND TALL NEIGHBORING STRUCTURES AFFECT THE DRAFT

afterward. For example, if the chimney for carrying off the smoke and gases is not properly built, is too small in capacity or too short, the expense of an alteration later on will be far greater than the cost of putting it in correctly in the first place.

Now let us take up the matter of chimneys and smoke pipes. In the engraving is shown several styles of chimneys. It is easily seen how the wind and air currents will act on these chimneys, and the principle of natural draft for the elimination of the smoke and soot is easily understood.

In the case of the common gable or hip roof the chimney must be carried up higher than any part of the roof. The chimney with its opening below the peak of the roof will not draw well, and on windy days

forge into the chimney, the piping flue must be the same size as the chimney flue in order to draw properly.

While flue sizes may differ according to the forge, a flue 8 by 4 inches will be found to work well for the ordinary sized forge.

Another matter that determines whether a chimney will carry off the smoke and gases from the forge properly is the location of the opening into the chimney or into the flue, and the distance between this opening and the tuyere or fire. To exert any influence upon the smoke and gases the draft opening should be as close to the fire as convenient. The opening should be about 6 inches above the surface of the forge, while the edge of the tuyere should be from 3 to 6 inches from the face of the chimney.

Under the Spreading Mulberry Tree

DAVID E. BONSTEAD

The picture shows myself and my sons under the spreading mulberry tree in sunny Queensland—temperature 106 in the shade on the 7th of January.

The other picture shows one of the streets in our town, which you can see is just a little country place. The first shop is where I spent over thirty years at the anvil. The shop beyond the tree is the Vulcan Forge where myself and my sons still carry on the business.

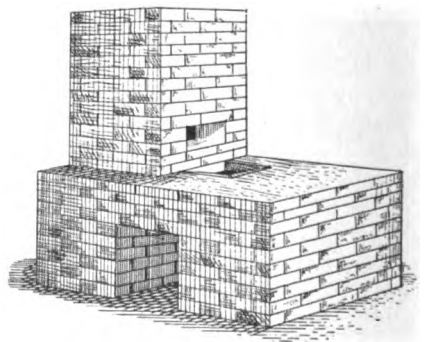


FIG. 3—ANOTHER STYLE OF FORGE



The picture taken under the tree will give you an idea of the kind of wagons we build here. This mulberry tree is a large, beautiful one with its heavily leafed branches spreading out in a great radius.

A Bolt Holder for the Plow Worker

G. E. BARTELL

In May I read that Mr. F. H. Pettit of Oklahoma wishes a good plow bolt holder. Here is an engraving of one that any smith can make. You can hook over edge of share and reach into the head of your bolt with the sharp end of rod and hold any



A STREET IN SUNNY QUEENSLAND

bolt. The handle and rod are of $\frac{5}{8}$ -inch round stock, 2 feet 6 inches long. The sliding collar is $1\frac{1}{4}$ by $\frac{3}{8}$ inch with a lug for the link. The link is of $\frac{1}{8}$ -inch stock and 2 inches long. The hook is 3 inches long from the



A BOLT HOLDER FOR THE PLOW WORKER

square end to the corner and 2 inches from the inside of the corner to the point. This holder is easily made and will hold a bolt solidly.

A Clinching Stand

CLARENCE J. LOUX

I notice an article regarding an iron stand for clinching shoes. Now I think I have a better one that is made from a piece of wood about three feet long with two legs in front. The wood may be either round or square with the corners taken off as shown in the engraving. When a smith once uses an article of this kind he will never want to do without one, and a horse will stand much better than when the knee is used. I



THE WORKING FORCE OF A QUEENSLAND SMITHY UNDER THE MULBERRY TREE

use it for both front and back feet. The engraving shows how the device is made and an explanation of it is unnecessary.

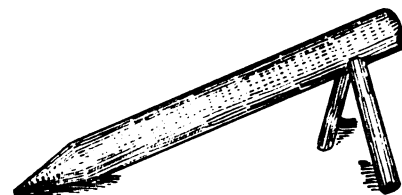
A Simple Wrench Easily Made

JOHN KEENAN

Here is a little tool which any smith can make within an hour, and which I'll guarantee is the handiest wrench you can get.

Take a piece of $\frac{1}{2}$ -inch gas pipe, 3 inches long, and weld it on the end of a $\frac{1}{2}$ or $\frac{1}{8}$ -inch rod about 4 feet long. Square the end for a bit brace

KNOW—don't guess! Know what business you are doing. Know what you are selling; what work you are doing; what pays best. Know from where your profits come and where



AN EASILY MADE CLINCHING STAND

your losses go. Know how often to turn your stock; know your stock.

Don't guess at anything in business. Insist upon knowing everything about what you are doing; and don't simply do things a certain way because your father did them that way. If there's a better way, do it that way or KNOW why.

Another Plow Bolt Holder

LESTER BRUMMEL

I am sending an illustration of a plow bolt holder which I use. Take a $\frac{1}{2}$ -inch iron rod about 23 inches long and weld on enough steel (a piece of an old rasp will do) to make it 24 inches long when drawn to a chisel edge, and be sure to have it not more than $\frac{1}{2}$ inch wide at point, as that will be wide enough and will also hold the smaller bolt. Now measure off 10 inches from the point,



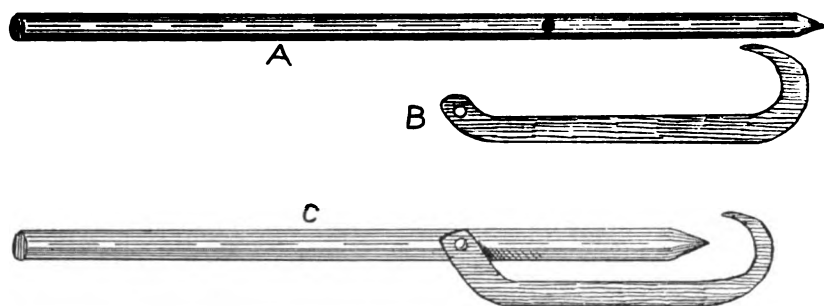
AN EASILY MADE SOCKET WRENCH

and then square the socket to fit a $\frac{3}{8}$ nut; now caseharden the point with potassium and cut out a hole with a hacksaw to allow the nuts to drop out. Will take off sixteen nuts in less than one minute.

Guessing and Knowing

How can any business man hope to "guess" his way to success in competition with men who "know"?

Yet there are thousands of men in business, and some of them are in the smithing business, who depend upon what they call their "judgment." And, yet, judgment without real facts, real records, real book figures to back it up, is just plain every-day guesswork.



ANOTHER DEVICE FOR HOLDING PLOW BOLTS

heat and flatten about 1 inch each side of the measured line, then drill a $\frac{1}{4}$ -inch hole at the 10-inch mark. Now take another $\frac{1}{2}$ -inch rod about 16 inches long and flatten one end about $2\frac{1}{2}$ inches back. Then make a square offset of $\frac{3}{8}$ inches and 2 inches from the end. Now prepare another piece of iron with a $\frac{3}{8}$ -inch offset and weld on beside the first, which will form a fork. Then drill a $\frac{1}{4}$ -inch hole through both prongs of this fork and then bend so that the hook piece will be about $1\frac{1}{4}$ inches from the straight one when they are standing parallel with each other. Then proceed to heat and draw the other end down to a point (but not too slim, as this is the important part because all strain comes on the hook) and curve it so that the chisel point will pass freely without catching. Now it is ready to be riveted together and appears as at C. To operate this is easy, as you can see at a glance that the hook is caught over the share and the point is placed against the bolt-head and held with one hand while you turn the nut with the other.

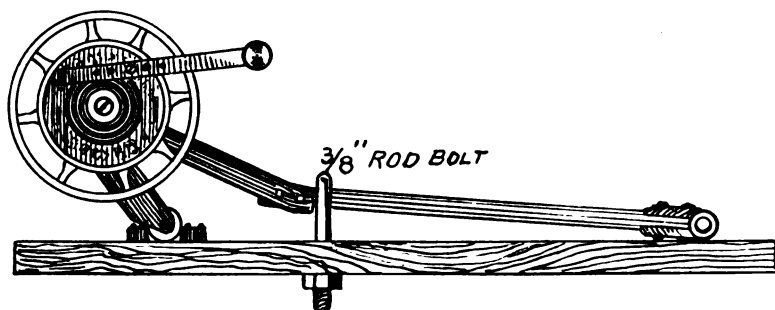
How to Sharpen Lawn Mowers

C. J. L.

Here are two simple ways for sharpening lawn mowers. First of all, remove both wheels of the mower and change the ratchets. Then draw the

knife or plate of mower against the revolving knives so that they can just be turned easily. Then take a quantity of powdered emery and add enough good oil to make a thin paste; put this on the blades and work the mower on the ground until the knives fit against the cutter or plate evenly. Sometimes it is necessary to adjust the blade or plate several times before it fits perfectly. Then replace ratchets and the mower will work to perfection.

Another way is somewhat like the above. Change the ratchets and then fasten the mower on a plank or bench, by putting strips on each side of the roller, and nail fast. Then make an open eye bolt to clamp the handle down on the bench or plank in which a hole should be made to receive the bolt. The bolt need not be more than $\frac{3}{8}$ inch round. Most wheels have a small hole near the edge. If there is none, it will be necessary to drill one in one side only. Then make a crank out of a one-inch steel tire piece about 15 or 16 inches long, with handle and one end fastened with bolt or screw. The other end can be forged down and bent down so as to catch rim of wheel. Then drill a number of holes in the handle piece for $\frac{1}{4}$ -inch stove bolts and to fit in the hole of the wheel. Now apply grease and powdered emery, turn crank and keep plates or knives tight together until the mower is sharpened. Then replace ratchets and the work is finished.



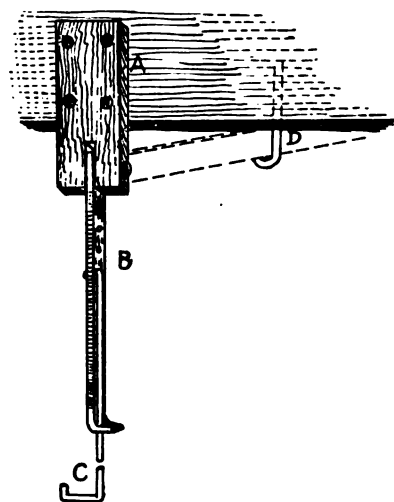
A SIMPLE WAY TO SHARPEN A LAWN MOWER

A Tire Holder for the Vehicle Shop

A. E. WARD

A smith who has any amount of tire work to do has not had a very long experience if he has not wished for an extra arm and hand at times.

The device illustrated acts as a third hand. It is fitted directly over the anvil and may be swung entirely out of the way when not in use. The piece, A, is of wood and may be any size or length just so it is well above the smith's head and out of the way of things in general.



A HANDY TIRE HOLDER

This piece is fastened firmly to the ceiling beam. The piece, B, is from old flat tire. It has holes bored as shown;—one at the upper end by means of which it is bolted to the wood piece, A. Several $\frac{1}{2}$ -inch holes are then bored in piece to allow for adjustment to length when piece C is fitted. The lower end of piece B is bent at right angles at about 1 inch from the end and then a $\frac{1}{2}$ -inch hole bored in the bent part. Now take a rod $\frac{1}{8}$ -inch in diameter and bend a short hook on one end and a long square hook on the other end. This is then put into the piece B, and the tire holder is complete. The hook, D, is simply for holding the device when not in use.

A Power Shop of Queensland

J. R. ELDER

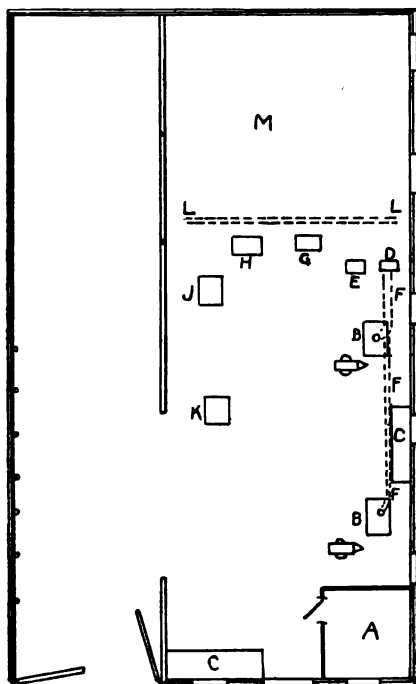
The accompanying engraving shows the exterior of my shop, which is 50 by 30 feet, with a wheelwright



shop in the rear. My shop contains a 3-horse electric motor which drives a fan for two fires, also an emery wheel and drilling and screwing machines. We do all kinds of blacksmith and wheelwright work and a great deal of shoeing and general jobbing. I have been in this town for fifteen years and have been in business for myself for almost ten years. I keep a body-maker, a blacksmith improver and two helpers, and I am a blacksmith myself and do most of the principal work.

This city has a population of almost 20,000 and has something over twenty smith shops and coach-builders.

The other engraving shows a ground or floor plan of my shop. A



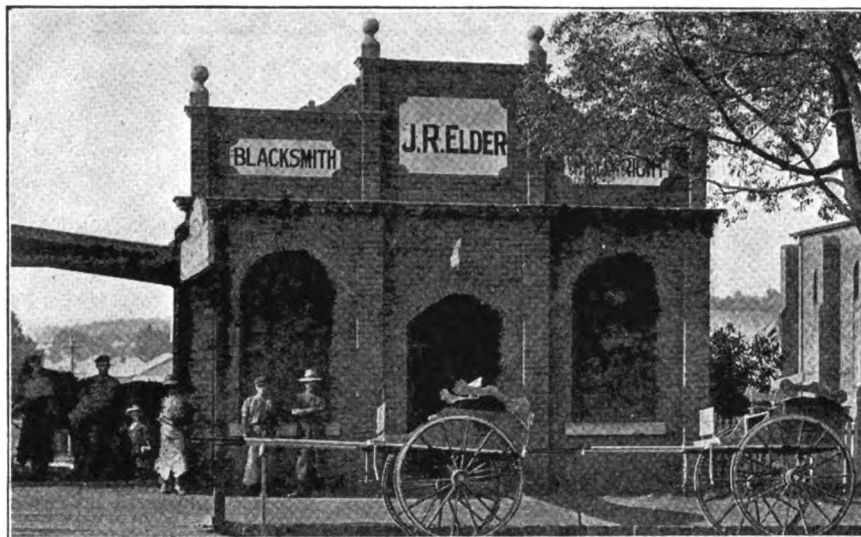
FLOOR PLAN OF MR. ELDER'S SHOP

represents the office; BB, the forges; CC, benches; D, the fan or blower; E, the motor; FFF, the blast piping; G, the emery stand; H, the drill; J, the screwing machine; K, the punch machine; L to L is a counter-shaft running above machines; M is the bodymaker's shop, while N is the shoeing floor.

A Concrete General Smithy of Washington State

WALTER TOY

Here is a picture of my shop. My oldest boy and myself are stand-



A POWER SHOP OF GENERAL WORK IN QUEENSLAND

ing at the right and constitute the working force. The other three little ones are my family. The shop is 36 x 55 feet, of reinforced concrete, with trussed roof and three skylights, and is up to date in every respect. The old idea that any kind of a shack with a dirty floor is good enough for a blacksmith's shop doesn't work, out this way. We are located in a good growing town and the prices are right. We get \$2.00, \$2.50 and \$3.00 for new shoes and \$1.00 and \$1.20 for resetting; and if there is anything we don't know and want to get posted on we look up THE AMERICAN BLACKSMITH.

A Pennsylvania Power Shop

D. S. ZIMMERMAN

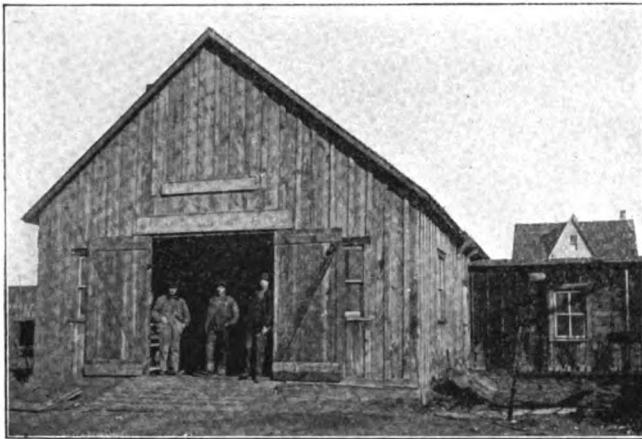
The main part of the shop is 24 x 36 feet, with an addition 12 x

22 feet. The addition contains an 8-horsepower Cray Brothers engine, a screw-cutting lathe, an emery stand and an Ideal lawn mower sharpener. The main building contains a 12-inch jointer, one L. F. Parks combined saw table, a 42-inch grindstone and a drill press. The jointer has an attachment made by the Sidney Tool Company of Sidney, Ohio, to surface lumber. The engraving, Fig. 2, shows the attachment hanging just over the jointer.

The two machines standing outside of the shop in Fig. 1 are Jordan engines which are used in a paper mill located in this place and which are here for repairs. I repair the paper company's machines at my shop and also do their other wood and iron work at their mill. In Fig. 3 is shown my gas engine and also the screw-cutting lathe.



MR. WALTER TOY'S CONCRETE GENERAL SMITHY OF WASHINGTON



THE OLD SHOP WHERE WOLD BROS. BEGAN,
TWO AND A HALF YEARS AGO



THE PRESENT SHOP OCCUPIED BY WOLD BROS.
WAS BUILT LAST FALL

Tempering Well Drill- ing Tools

L. R. SWARTZ

Since the process of heating and forging in dressing bits is of such vital importance in producing a proper temper, we will (for the sake of convenience) assume that they are but a part of the process of tempering, and treat them under the same head.

With good, clean coal, make a deep fire and when it is well started put the bit well into it so as to get four or five inches of the end hot—as bakers say, “use a moderate oven.” Do not hurry the heat but give it a chance to work through the steel evenly and, in order to do this, turn the steel over in the fire so as to get a uniform heat from both sides. Avoid a sharp, cutting blast, but work with a steady, even blow to your fire. Do not burn the corners of the bit—a small, shallow fire with sharp blast is certain to burn the corners, and burnt steel will not cut hard rock. The corners do

about two thirds the cutting. A 14-inch fan for tool dressing is recom-



FIG. 1—THE SHOP OF MR. D. S.
ZIMMERMAN OF PENNSYLVANIA

mended. The 6-inch and 8-inch fans put on some machines are too small.

After the bit is hot, give it a good strong hammering in the center with a 10-pound sledge, and work out to each corner from the center. Keep turning the bit over so as to forge both sides alike. Have the edge straight across and not rounding and

the corners $\frac{1}{4}$ to $\frac{3}{8}$ inch larger than the gauge. Reheat the bit to bring in the corners. In bringing in the corners, begin where the flare starts to swell from the shank, and work down to the corners.

If the forging does not begin near the shank, the steel will push up and form a sheet after a few dressings, and it is then only a question of time and cold water as to how soon the corner will crack and fly off. Strike hardest when the bit is hot, and lighter as it cools. See that your fire is clean, and raise your hardening heat.

Use a tub 6 or 7 inches deep, and have in it a rack of worn-out tire iron, so that you can stand the bit on its sharp edges to allow the water to reach the cutting edge from below. The water should only reach up $1\frac{1}{4}$ inches on the steel and be agitated until the bit is hardened. Then lay the bit down and rub the bevel bright with brick or sandstone, and as the color runs down to a coppery straw color, quench, and the color will be about what you want.



FIG. 2—A CORNER OF THE WOOD-WORKING SHOP

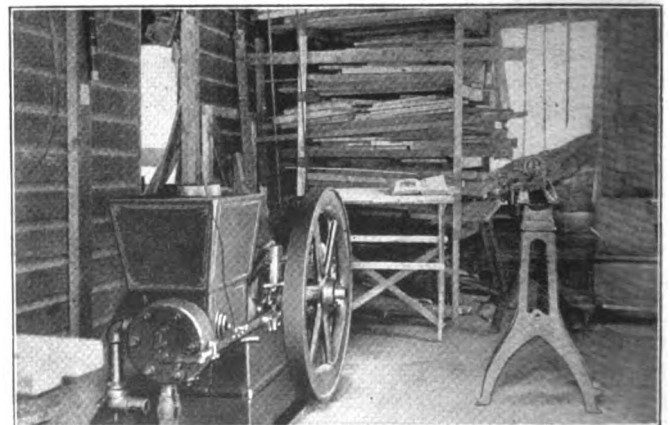


FIG. 3—THE POWER CORNER, SHOWING LATHE



THE GENERAL SHOP OF EMERY
JENKS OF IDAHO

Unless you have poor steel to begin with, you will have a good job. If your steel has lost carbon on account of poor coal or overheating and refuses to harden properly, make a paste of rye chop, resin, salt and water



TWO SONS OF VULCAN IN
NEW ZEALAND

in the following proportions: Two parts chop, one part resin, one part salt and enough water to form a stiff paste.

Allow the bit to cool until it is black. When you have finished forging paint the bevels and corners with the paste before raising to the hardening heat. This forms a crust. Now put into the fire and heat and harden as above described.

In the bath, dissolve about a pint of salt and a lump of alum and blue-stone about the size of an egg.

This treatment has given good results even with poor steel and will not harm the best steel. A bit cannot be properly dressed for hard rock in a hurry. About forty-five minutes is the time required to dress and temper $5\frac{5}{8}$ to 6-inch bits.



A Fable With a Moral

THE EDITOR

On the average, few men are ever fired—they fire themselves, but precious few will admit it even to themselves.—

Once upon a time a blacksmith through a series of "swaps" or tradings acquired an ox and a horse. As this blacksmith operated the machinery in his shop by means of a treadmill, he employed the horse and the ox to work the treadmill.

One evening after an especially hard day in the busy season, and after the blacksmith had stabled the animals for the night, the ox said to the horse: "Horse, we have now finished our fourth day of continuous treading. You will admit, I am sure, that it has been exhausting work. Let us therefore pretend on the morrow that we are sick. Our master will not compel us to work when we are sick and we can then lie here in the stable and rest for a day."

But the horse, true to the fabled stories of faithfulness that have come across the centuries, would have none of it.

"No," said he, "our master treats us fairly. He feeds us, provides a place for us to sleep

and cares for us in sickness. We must in turn operate his machinery so that he can do his work. No, I will not pretend that I am sick. You may if you wish, but I will work tomorrow as well as I am able."

And so the ox played off sick when the blacksmith came to put the animals to work. The smith therefore placed feed and water beside the ox, saw that he was comfortable and then put the horse to work alone.

All day long the ox lay comfortably on his bed of clean straw, and contentedly listened to the grind of the treadmill. At night, when the horse came in after his day's work, the ox questioned him, saying, "How did the work proceed today and what did our master say about me?"

"The work was hard today," replied the horse, "and as I had to work the treadmill alone we did not accomplish as much as we should have."

"Did not our master refer at all to my absence or sickness?" again questioned the ox.

"No," returned the horse. "He said nothing whatever concerning you. He was too busily engaged with the work."

"Then I think," said the ox, "I will again play off sick tomorrow, for it is certainly fine lying here in the soft, clean straw all day with nothing to do but to chew one's cud."

So the following day the ox again played off sick, and again the blacksmith placed feed and water beside him, saw that he was comfortable and put the horse to work alone.

All day long the ox lay comfortably on a clean bed of straw and all day contentedly listened to the grind of the treadmill.

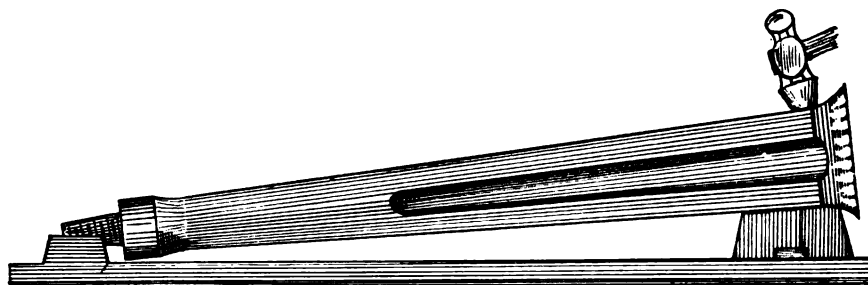
At night the ox again questioned the horse, saying, "How did the work go today and what did our master say of me?"

"The work seemed harder today," replied the tired horse, "and we seemed to accomplish less than yesterday."

"Did not our master have anything to say about me?" again questioned the ox, contentedly chewing his cud.

"He said nothing about you to me," returned the horse, "but he did have a long talk with the butcher when the butcher came in to have his horse shod."

THE MORAL—The next time you find a man "lying down on his job," tell him this story and ask him to tell you the moral.



FORGING AND TEMPERING WELL-DRILLING TOOLS



THE IRON, STEEL AND HEAVY HARDWARE ASSOCIATION HAD ITS PICTURE

Take Him Out

W. O. B.

BASEBALL NOTE:—Pitcher Mayer being hit rather freely was taken out in the sixth inning.

This cruel game of life is as tough as a rock—
If you're not right in form and you slip—
There is always a crowd just waiting to knock,
And to bawl you out good when you trip.
There are all kinds of chaps on God's good old earth,
But the chap we'd be better without
Is the chap who shows up what his real worth
When he starts in to yell: "Take him out".

When you see a poor chap doing all that he can,
Though he knows that the going's damn tough,
Don't stand back and knock, but act like a man
And show him you're made of right stuff.
We ourselves don't always "make good",
There are times when we strive with a doubt,
But where would we be if we "went to the bench"
When the crowd starts to yell: "Take him out".

So, remember, "Old Top," while you're watching the game—
While you're judging the chap on the slab,
That all the fool stunts of the chap that you blame
Are no worse than the "bulls that you stab",
In your office or shop you sometimes fall down,
But how can you work your way out
If some boneheaded guy yells out like a clown
"Can that bush league gink.—Take him out".

Envoy

And when the game of life is o'er and
you journey to that land
From whence no traveler e'er returns,
and hear the angel band
There'll be a big, broad grin go 'round—
you'll feel just all put out
When, finally, your record's found, and
Pete says: "Take him out".



You cannot enter a lazy smith's shop without getting dirt on your clothes.

A man may be a "dead beat" and still be able to borrow all the trouble he wants.

When filling a gasoline tank, don't smoke. Your pipe or cigar may fall into the tank and clog the carburetor.

None is so hopelessly handicapped in the race of life as the man with lack of faith; he is beaten before he starts.

Summer dullness, did you say? Try Keep-a-hammerin'; it's our remedy for all business ills. Try it and be convinced.

Ever hear of competitors competing to see who could do the most co-operating? However—that is as it should be.

Thornton says: "Never take money out of your business to cater to a luxury until you are sure the business does not need it."

Don't hesitate to notify us when you miss your copy of "Our Journal." We want to know about it promptly. We want you to keep your file complete.

Don't start a grinding job until you are sure the speed of your wheel is correct. Failure is often turned into success by merely correcting the speed. It should be right—not "near enough."

There's a smithshop of world-wide renown That today is closed and shut down;

For the fish in the bay

Are biting today—

A card says: "Tom's gone out of town."

Most men know that it requires an investment to produce dividends; yet when dealing with the other fellow some chaps forget that principle. Give the other fellow

a little more than you would expect him to give you.

Ol' Bill Trainer ses: "A good horse never ain't too ol' t' play; an' it's about the same with a good man; an' a good horse runnin' free in a pasture will teach a man more good, healthy play than any bottle, keg or pail that we ever saw."

It's not so much the hardness of the lead as it is the power back of it that determines the penetration of the bullet; and the secret of many men's successes is their velocity—the force with which they throw themselves at an obstacle. What most of us need is velocity.

Don't let the summer slip by without taking a much needed vacation—if only for a day or two; and take the Mrs. and kiddies with you; they will enjoy it, too. Of course it will cost, anything that is worth having will cost, but it will be worth every cent it costs if you go at it RIGHT.

What is The American Blacksmith doing for you? Does it help you? Does it make you think? Does it ease your work? The amount of good, practical help you receive from its pages depends upon the amount you wish to receive. The only way to get full, heaping value for your dollar is to read the paper and apply its teachings to your work.

A heavy purse makes a light heart. A man who has practiced strict saving plans says: "I got into the habit of forcing myself to yield a surplus every month. When I have saved a few hundred dollars I look for a good investment—real estate, in a good place at a good price. I then improve it, borrowing the money if necessary, and renting as quickly as possible. I look for a purchaser at a profit, and I feel safe and am ready for the rainy day."

A white blacksmith shop—whoever heard of such a thing? Seems preposterous, doesn't it? But the Pittsburgh & Lake Erie Railroad has one.

"The blackest, darkest, dirtiest physical place about most railroads and most industrial plants is the blacksmith shop; but the Pittsburgh & Lake Erie has a white blacksmith shop," says the Engineering Magazine. "The more unsanitary a locality like Panama, the more necessity for supreme effort to make it healthy, and the Isthmian Canal was primarily made possible by sanitation. The darker and blacker a shop, the more necessity for making it light and clean. Usually the windows in blacksmith shops are carbon incrustated, the air is contaminated with sulphurous acid and carbon monoxide, so that even the leather belting which ought to last fifty years corrodes and goes rotten in a few weeks. In



ILE ON A VISIT TO NIAGARA FALLS DURING THE BUFFALO CONVENTION

the Pittsburgh & Lake Erie blacksmith shop the interior walls are painted and repainted white, so that they are always white; the forges are whitewashed white outside and in, and maintained white, a work requiring a few hours once a week; the panes of glass are as clear as in a careful housekeeper's home—all with one exception, that one near an oil-splashing bearing, which made the cleaning a dangerous operation, to be done only when the machinery was not running."

The Iron, Steel and Heavy Hardware Association in Convention

The Fourth Annual Convention of the Iron, Steel and Heavy Hardware Association was held in Buffalo on June 10th, 11th and 12th.

The convention was opened Tuesday morning by President Charles E. Faeth. After the usual addresses, roll-call and committee appointments the meeting adjourned until the afternoon when an executive session was held. In the evening the visitors were the guests of the Buffalo Automobile Club at their beautiful country clubhouse.

On Wednesday, after an executive session, a trip was made to the Buffalo Bolt Company's plant where, after an inspection tour, a luncheon was served. After luncheon the visitors went to Niagara Falls. An open session after the return from the Falls closed the day.

Thursday's business sessions were followed by a banquet which was a most fitting close to one of the Association's most successful conventions.

Much credit is due the various committees for the able manner in which the business and entertainment features were handled.

For More Interest in Our Favorite, the Horse

For some months, Mr. Ralph C. Watrous, as President, has been organizing the National Association of Allied Horse Interests, which association we are sure will do much to help the cause of the horse in this country.

The object of this association is to promote "publicity for the horse, horse equipment and horse-drawn vehicles. The establishment of a co-operative association for the creation of interest in the horse, horse breeding, sports and industries allied with the horse."

It was through Mr. Watrous and the Rhode Island-Perkins Horseshoe Company, of which Mr. Watrous is general manager, that the horse interests received such a "big boost" at the recent Buffalo Convention mentioned elsewhere on this page. The coach and six-in-hand with Mr. Kehoe as whip created a sensation in Buffalo, and the interest displayed

by both the convention delegates and Buffalonians generally showed that interest in the horse is by no means a thing of the past.

The horses for this coach were brought direct from the Plainfield Horse Show and were used to convey numerous parties about the city. The high price of gasoline and other incidentals connected with the use of the automobile has seemed to make people, who for a time neglected the horse, return to the use of their old favorite.

Mr. Kehoe, who handled the reins, is a veteran coach whip and has handled some of the finest horses in this country. His work behind these active high steppers around Buffalo during the convention did him great credit.

It may interest readers to know that membership in the National Association of Allied Horse Interests is open to any "individual, partnership or corporation interested in the horse." Full information concerning the association, membership fees, etc., may be had from Mr. George H. Webb, Secretary-Commissioner, Providence, R. I.



THE COACH AND SIX-IN-HAND OF THE RHODE ISLAND-PERKINS HORSESHOE COMPANY AT THE BUFFALO CONVENTION



Our Honor Roll

In Dollars and Cents

The saving you make in real dollars and cents when you take advantage of Our Long-Time Rates should not be overlooked. There are, of course, other advantages, but the real worth-while saving you make in real, hard money is important—and in these "days of high cost" in practically everything it is well to take advantage of every possible saving.

Just to show you how important the money-saving feature of Our Long-Time Rates really is, examine the following table. Here is shown in plain figures just the exact saving you make.

	U. S. and Mexico	Canada	Other Countries
2 yrs.	\$1.60 save \$.40	\$2.00 save \$.50	10 sh. save 2 sh.
3 yrs.	2.00 save 1.00	2.70 save 1.05	14 sh. save 4 sh.
4 yrs.	2.50 save 1.50	3.20 save 1.80	18 sh. save 6 sh.
5 yrs.	3.00 save 2.00	3.75 save 2.50	1 £ save 10 sh.
10 yrs.	5.00 save 5.00	7.00 save 5.50	1 £ 14 sh. save 1 £ 6 sh.

You can make that saving almost any amount, so why not do it—NOW?

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J. BAILEY, Man.	Dec., 1923	J. B. JEFFRIES, Pa.	Apr., 1918
W. R. TURNER, Man.	Oct., 1923	J. LIPPETT, Ill.	Apr., 1918
W. SCHOONOVER, Pa.	Apr., 1923	OTTO TIETZ, S. Africa.	Apr., 1918
G. E. GLAZIER, Ohio.	Mar., 1923	Geo. SMITH, N. Z.	Mar., 1918
T. BRADLEY, N. S. Wales. Mar.	1923	AUG. HOLZENAGEL, Ore.	Mar., 1918
I. T. NEEDHAM, Ill.	Feb., 1923	A. E. UEHILING, Wis.	Mar., 1918
G. C. DISINGER, Miss.	Feb., 1923	P. J. THORNEYCRAFT, N. W. T. Mar.	1918
J. HUGHES, Ohio.	Feb., 1923	J. C. YOUNG, Pa.	Mar., 1918
J. WIEBER, Minn.	Jan., 1923	D. C. HOUCK, Ohio.	Mar., 1918
Z. A. ENOS, Kan.	Jan., 1923	F. P. FELLOWS, N. Y.	Feb., 1918
W. G. WISE, Cal.	Jan., 1923	J. W. STEADMAN, Ohio.	Feb., 1918
F. S. BISHOP, S. Africa.	Jan., 1923	J. P. HOLKAPPEL, Penn.	Feb., 1918
S. P. HARNEY, Mont.	Dec., 1922	E. N. GATES, Vic., Aus.	Feb., 1918
W. BRECKNER, Okla.	Dec., 1922	RENTON WAGON WKS., Wash.	Feb., 1918
J. PABIAN, Neb.	Dec., 1922	WHITING Fdy. Equip. Co. Ill.	Feb., 1918
P. FREDERICKSEN, Iowa.	Nov., 1922	J. P. KOENIGS, S. Dak.	Feb., 1918
L. O. LEIURS, Ill.	Nov., 1922	RICHARD BRENNER, Tex.	Feb., 1918
W. LAWSON, N. Z.	Nov., 1922	W. F. HILL, N. C.	Feb., 1918
W. H. MILLER, Iowa.	Oct., 1922	J. B. BETTEL, Me.	Jan., 1918
A. O. MARTIN, Idaho.	Sept., 1922	W. MISCABLE, Queen, Aus. Jan.	1918
O. A. MORTIMORE, Idaho.	Sept., 1922	S. PORTELANCE, Que.	Jan., 1918
H. J. WYATT, Wash.	Sept., 1922	D. C. FOLEY, Cal.	Jan., 1918
J. N. SKOW, Ia.	Sept., 1922	GLEASON BROS., La.	Jan., 1918
A. D. STANDFORD, Wash.	Sept., 1922	C. E. KRUG, Wis.	Jan., 1918
T. TEMKIEWICZ, Que.	Sept., 1922	G. E. WOODARD, Kan.	Jan., 1918
A. PFYFFER, Ohio.	Aug., 1922	P. J. DALLY, W. Aus.	Jan., 1918
W. D. VALENTINE, Iowa.	Aug., 1922	J. MORROW, Pa.	Jan., 1918
G. HOFFMAN, N. Y.	July, 1922	F. PROCTOR, Tas.	Dec., 1917
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LOUISA CARRIAGE WKS., Va. May.	1922	J. VOELPEL, Ill.	Dec., 1917
S. SMITH, Tex.	Apr., 1922	W. J. MAIN, Cal.	Dec., 1917
J. W. HAAR, La.	Apr., 1922	G. J. SAUER, Mo.	Dec., 1917
E. A. DILLON, Nev.	Mar., 1922	MESS BROS., Vict.	Dec., 1917
D. W. SMITH, R. I.	Mar., 1922	E. BLOOMER, Aus.	Dec., 1917
D. F. KUSTER, Wash.	Mar., 1922	H. P. ADAMSON, N. Zealand. Dec.	1917
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R. S. CRISLER, Ky.	Jan., 1920	B. A. STEINKE, Ohio.	Nov., 1917
ED. GRIMM, Tex.	Mar., 1920	J. N. BATHGATE, N. Dak. Nov.	1917
T. P. CONBODINE, Mass.	Dec., 1920	W. H. Houghton, Pa.	Nov., 1917
J. NAIRNTH, N. Zealand.	Nov., 1919	W. T. CUTKOMP, Iowa.	Oct., 1917
THEO. PASCHKE, Neb.	Apr., 1919	J. DELAUS, Neb.	Oct., 1917
I. M. TOWNSEND, Cal.	Apr., 1919	Geo. POTSCHEK, Mo.	Oct., 1917
G. BISH, Fiji Islands.	Apr., 1919	J. W. RAPS, N. Y.	Oct., 1917
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R. TAYLOR, N. Z.	Feb., 1919	W. N. MILES, Ky.	Oct., 1917
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PETER COCKS, W. Aus.	Sept., 1918	FRED. BLOHM, Tex.	Sept., 1917
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A. DISCHER, Aus.	Aug., 1918	CLARK & FAUSET, Queens. Aug.	1917
C. R. OLIVER, S. Africa.	July, 1918	C. L. HOCKETT, Cal.	Aug., 1917
L. G. REID, S. Africa.	July, 1918	H. C. STENZEL, Tex.	Aug., 1917
WRIGHT & SON, Tex.	June, 1918	M. DELJAGER, S. Africa.	Aug., 1917
ALBERT MELLUM, N. D.	June, 1918	F. HOWARD, Kan.	Aug., 1917
H. L. HASWELL, N. C.	May, 1918		
H. S. YONGUE, Wash.	Apr., 1918		

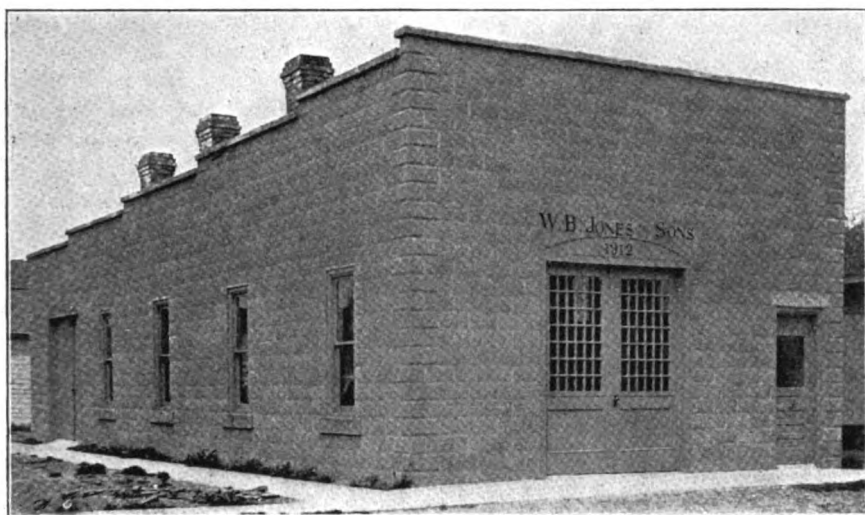
NAME	Subscription Paid to	NAME	Subscription Paid to
H. FERREL, Ill.	Aug., 1917	J. MACUAB, Scotland.	Nov., 1916
J. MCMEKEN, N. Z.	Aug., 1917	P. GRESSEN, Ill.	Nov., 1916
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A. I. PITTENGER, Ill.	Aug., 1917	W. G. SIM, N. Z.	Nov., 1916
F. G. STONE, S. Africa.	July, 1917	H. V. RUEHL, Ala.	Nov., 1916
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V. J. HUBBARD, N. Y.	July, 1917	PITTMAN STELL, N. C.	Nov., 1916
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J. H. BAKERBERG, S. Africa.	June, 1917	C. W. SCHMIDT, Cal.	Oct., 1916
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A. GUNTTLER, Tex.	May, 1917	T. J. HASKINS, N. S. W.	Oct., 1916
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A. DATWYLER, Ohio.	May, 1917	W. B. KNOUFF, Ala.	Oct., 1916
F. PETTIT, Okla.	Apr., 1917	GORMAN BROS., Ia.	Oct., 1916
H. G. MARRIOTT, Utah.	Apr., 1917	W. H. F. BRAUCE, N. C.	Oct., 1916
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S. STEPHLE, Ohio.	Mar., 1917	A. J. HAMMOND, Cal.	Sept., 1916
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A. J. H. WEGENER, S. Africa.	Feb., 1917	J. W. FOWLER, N. Z.	July, 1916
H. SCHNETTE, Ill.	Feb., 1917	A. C. LODWIG, Cal.	July, 1916
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J. W. HAUGHT, Ill.	Feb., 1917	I. B. BARKER, Ill.	July, 1916
CHAS. F. GIESSE, N. Mex.	Feb., 1917	H. M. LARSEN, Wis.	July, 1916
M. E. GOLLER, Pa.	Feb., 1917	Geo. P. MACINTYRE, Me.	July, 1916
J. POTTHOFF, Neb.	Feb., 1917	Jas. A. BUCHNER, Mich.	July, 1916
G. M. GARETT, Mich.	Feb., 1917	H. M. FINGER, Ar.	July, 1916
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G. W. WHITTINGTON, W. Va.	Feb., 1917	F. G. WILSON, Calif.	July, 1916
J. H. HOYLE, S. Africa.	Feb., 1917	I. H. HALL, Ind.	June, 1916
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AUGUST MILLET, Ill.	Feb., 1917	G. R. HARRISON, Aus.	June, 1916
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O. DANNEMAN, Minn.	Jan., 1917	W. VOIGHT, S. Africa.	June, 1916
S. HETEM, S. Africa.	Jan., 1917	MARTIN JENSEN, Wis.	June, 1916
G. A. GURLEY, Ore.	Jan., 1917	CHESTER HUMBERT, Wis.	June, 1916
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H. KAHN, Ia.	Jan., 1917	C. MORRELL, N. Brunswick.	June, 1916
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F. G. A. WILLIAMS, S. Aus.	Jan., 1917	ADAM SCHMITT, Mich.	June, 1916
B. S. CASEY, Mass.	Dec., 1916	D. M. MILIT, N. Y.	June, 1916
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J. B. SCHEIDLER, Ind.	Dec., 1916	J. G. REEVES, S. Aus.	May, 1916
F. KUMMER, Ohio.	Dec., 1916	I. H. LUNDER, N. Dakota.	May, 1916
ALFRED CASE, N. Z.	Dec., 1916	JAMES SINCLAIR, W. Aus.	May, 1916
H. GRIMM, Utah.	Dec., 1916	H. BAKER, Aus.	May, 1916
A. H. GOODING, S. Aus.	Dec., 1916	E. Q. KREHBIEL, Kan.	May, 1916
LEONARD SMITH, N. J.	Dec., 1916	C. H. CAIRNS, N. Y.	May, 1916
C. F. SHAW, Man.	Dec., 1916	P. V. JOHNSON, Ohio.	May, 1916
W. ELWARD, Pa.	Dec., 1916	F. E. SMITH, Vt.	May, 1916
W. W. EOLY, Pa.	Dec., 1916	C. A. STEBBINS, Kan.	May, 1916
JOS. BOYER, Mich.	Dec., 1916	SANFORD BAKER, Mo.	May, 1916
J. WILLIAMS, N. S. Wales.	Dec., 1916	E. B. ANDERBERG, Ill.	May, 1916
J. H. W. SCHNEIDER, Cal.	Dec., 1916	N. W. BOWEN, Ind.	May, 1916
W. SAUER, Minn.	Dec., 1916	S. L. HIGGINS, N. H.	May, 1916
F. F. DARLING, Cal.	Dec., 1916	J. NEEDHAM, Kans.	May, 1916
CHAS. NEWLAND, Cal.	Dec., 1916	HENRY DOERR, Ore.	Apr., 1916
J. T. BRAHM, Ia.	Dec., 1916	R. PURSCHKE, Mo.	Apr., 1916
P. H. ST. LOUIS, Wis.	Dec., 1916	WESS POTER, Mich.	Apr., 1916
A. E. NICKOLS, Okla.	Dec., 1916	J. YOURNELL, Ohio.	Apr., 1916
C. J. HALL, Wash.	Dec., 1916	J. B. WILDAVIN, Pa.	Apr., 1916
BOB FRICKE, Ala.	Dec., 1916	PRATT INSTITUTE, N. Y.	Apr., 1916
JOERIS BROS., Tex.	Dec., 1916	B. PETERSON, Minn.	Apr., 1916
R. CLEMENS, Conn.	Dec., 1916	H. R. HAYNES, Mo.	Apr., 1916
SCHREFFLEY & SCHMITT, Pa.	Dec., 1916	S. H. AMES, Pa.	Apr., 1916
A. BRAUSE, Ohio.	Dec., 1916	KASS BROS., Ill.	Apr., 1916
J. E. BEATTY, Mo.	Dec., 1916	J. MCGARVA, Ill.	Apr., 1916
Geo. CASSIE, Scotland.	Dec., 1916	G. H. SPINK, N. Y.	Apr., 1916
JOHN KAIN, Ky.	Dec., 1916	R. H. KUHN, Iowa.	Apr., 1916
F. W. HOWELL, Ill.	Dec., 1916	WELSH BROS., Ind.	Apr., 1916
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W. M. GRIFFITHS, Aus.	Nov., 1916	G. F. BOWERS, Okla.	Apr., 1916
W. B. TAYLOR & Son, Mo.	Nov., 1916	E. E. McDONALD, Fla.	Apr., 1916
G. WHITTEN, Mass.	Nov., 1916	JAMES BAXTER, S. Africa.	Apr., 1916
J. M. VINCENDA, Wis.	Nov., 1916	E. P. DIGNAN, S. Aus.	Apr., 1916
TOM NOLAN, S. Aus.	Nov., 1916	W. H. WINGET, Vt.	Apr., 1916
H. J. FRENCH, N. Z.	Nov., 1916	JOE BROWN, Tex.	Apr., 1916
F. N. BROWNING & Son, Ky.	Nov., 1916	AUG. PANSTIAN, Wis.	Apr., 1916



Answers to Questions in June Issue

1. It is best to scrape out all dirt and grease until a clean wood surface is exposed. Boiling in various solutions is not recommended, as the hub will absorb water and swell.

2. A simple method is to take an old box that will fit into the box in the hub and heat it to a good red. Then drop it into the box to be removed.



THE MODERN SMITHY IS RUN BY MR. W. B. JONES AND HIS SONS IN INDIANA. HOW IS THIS FOR AN IDEAL?

This heating will melt the old grease, cause the box to expand slightly and, when cool, it will contract sufficiently to allow its removal with a tap or two of the hammer on the nut end.

3. Line the hole in the hub with strips of heavy, tough paper, canvas or other tough cloth, or with strips of leather (according to the amount of space to be filled), and then drive the box into the hub quite hard.

4. Glue used in vehicle work should be of the best quality—nothing else is good enough; and when the best glue is used, the thinner it is the better. It should soak into the wood and bring the pieces together just as close as possible.

5. The spokes may be wet with water, dipped into wood ashes and then driven.

6. Glue left for any considerable time in the pot will decompose and lose its strength.

7. Good glue may be told by its clearness, by the bubbles it contains and by its freedom from specks. Good glue will contain air bubbles to a certain extent, but if the bubbles

are very numerous or very large they are more likely to be caused by decomposition, indicating poor quality.

8. The hub, no matter how well seasoned, will dry and undergo changes, especially on the newly made surfaces of the mortise.

9. The dish is best built into the wheel, and not forced in by the tire.

10. A so-called "two-point" bearing is best, because the solid bearing is inclined to wear at the ends, thus

and Commerce. Sent to printer, January 21, 1913.

Be It Enacted by the People of the State of Nebraska:

SECTION 1. A person who makes, alters, repairs or in any way enhances the value of any vehicle, automobile, farm implement or tool, or shoes a horse or horses at the request or with the consent of the owner shall have a lien on such vehicle, automobile, farm implement or tool, or horse or horses whether in his possession or not, for his reasonable or agreed charge for the work done or material furnished; provided that the person making such repair or furnishing such material file in the office of the clerk of the county in which such work is done or material furnished within sixty days a verified statement and description of the work done or the material furnished and a description of the article so repaired, altered or furnished, or the horse or horses shod.

SEC. 2. Such lien, so filed, shall become paramount to all other liens except those of like nature and shall be treated in all respects as a chattel mortgage and be foreclosed in manner and form as provided by law; provided, however, that such foreclosure proceedings be instituted within six months of the filing of such lien.

SEC. 3. Whereas an emergency exists, this Act shall be in force upon and after its passage and approval according to law.

The National Association of New Zealand Formed

In March a conference of New Zealand carriage builders met in the capitol city, Wellington, and formed "The Carriage Builders', Wheelwrights' and Motor Car Builders' National Association of New Zealand."

The objects of the Association are the advancement of trade interests in every way possible, by unity and activity. Mr. J. Bett is President and Mr. George Dash is Secretary.

A Buggy Guarantee

W. A. HEISS

We are enclosing herewith a slip which we attach to every buggy which we build. This contains our guarantee and rules for the care of vehicles. This may be of interest to other readers of "Our Journal":

GUARANTEE

We guarantee all our work from date of sale. In case any breakage should occur in period named, showing defective material, we will make same good on return of broken parts to us, we paying freight one way only. In no case will we allow charges for repairs unless satisfactory price has been previously agreed upon.

PAINTING

We use the best quality of paints and varnishes that can be procured, strictly pure white lead, and take ample time for

The Nebraska Lien Law Passed

We are advised by Mr. Bob McIntyre of Nebraska, who is Vice-President and Acting Secretary of the Nebraska Blacksmiths', Horse-shoers' and Wheelwrights' Association, that an artisan's lien law has been passed by the Nebraska Legislature and has already been signed by the Governor.

Mr. McIntyre has sent us a copy of the bill as presented and read:

An Act providing for artisan's lien on personal property and declaring an emergency.

Introduced by Representative J. E. Harris, of Buffalo County

Introduced and read first time, January 20, 1913. Read second time, January 21, 1913, and referred to Committee on Retail



running the work through our factory. We warrant the painting, provided our "Rules for the Care of Carriages" are observed.

RULES FOR THE CARE OF CARRIAGES

Carriages should be kept in a dry building, located away from the stable and manure heap. Ammonia fumes crack and destroy varnish and fade the colors both of painting and cloth.

Never allow mud to remain long enough on a newly painted carriage to dry on it, or spots and stains will invariably result.

While washing a carriage keep it out of the sun. Use plenty of water. Care should be taken to wipe the surface quite dry with a soft chamois leather after each washing. Never allow water to dry of itself on a carriage, as it invariably leaves stains. Hot water or soap should never be used in washing a varnished surface.

To prevent and destroy moths in woolen linings use turpentine and camphor.

Examine the axles frequently. Keep them well oiled and see that the washers are in good order. Should the tires of the wheels get at all slack, have them contracted at once or the wheels may be permanently injured.

An Improved Oxy-Acetylene Welding Plant—I

ALBERT H. WAYCHOFF

The Acetylene Generator

This is intended for the mechanic who needs a good serviceable oxy-acetylene welding plant and who at the same time does not see fit to invest several hundred dollars in an outfit. The cheapest machines on the market are now selling at about \$200, and from that price, up. Thinking, as they are lead to believe by various manufacturers, that oxy-acetylene welding plants are very complicated, and at the same time unless properly made are very dangerous, very few attempts have been made by any mechanic to build an outfit. Yet a home-made plant such as I will describe is as safe as an ordinary brazing outfit.

The writer has had a lifetime experience operating oxy-acetylene outfits and at odd times built the one described. I have done as good work with it as I have with a large one-thousand-dollar one. I started in about five years ago to make one that every machinist, auto repairman, blacksmith and mechanic could afford and have been more successful than I had figured upon. It was my experience that manufacturers of various oxy-acetylene welding machines refused to sell any part of their outfits unless a person already owned one of their particular makes of machines.

I finally found one firm that would sell me a torch for forty-five dollars, which was more than the cost of the whole outfit I designed, which is fully explained on the following pages.

The writer wishes to say that, while the generators, etc., are about the average size for ordinary work, yet the sizes and dimensions may be changed to suit the builder's needs.

Before commencing on the building of the plant I will try to give the reader a little information regarding the many uses of the plant, which is described on the following pages.

Oxy-acetylene welding, or autogenous welding, is the uniting of metals by heat without the aid of any compression or hammering. While

The hottest temperature of the best solid fuel flames is about 3000° F. The oxy-hydrogen flame, which was the hottest known flame, was about 4000°, while the oxy-acetylene flame goes to about 6000°, or double the highest solid fuel flame. As acetylene produces about five times more flame per cubic foot than hydrogen, and about doubles it in intensity, a very powerful flame is condensed in a very small volume. So, with a torch with a heating power from two to three times that required to melt the commercial metals, almost incredible results are obtained. By this process, iron, steel, cast iron, aluminum, brass, copper, platinum and other metals can be so perfectly united

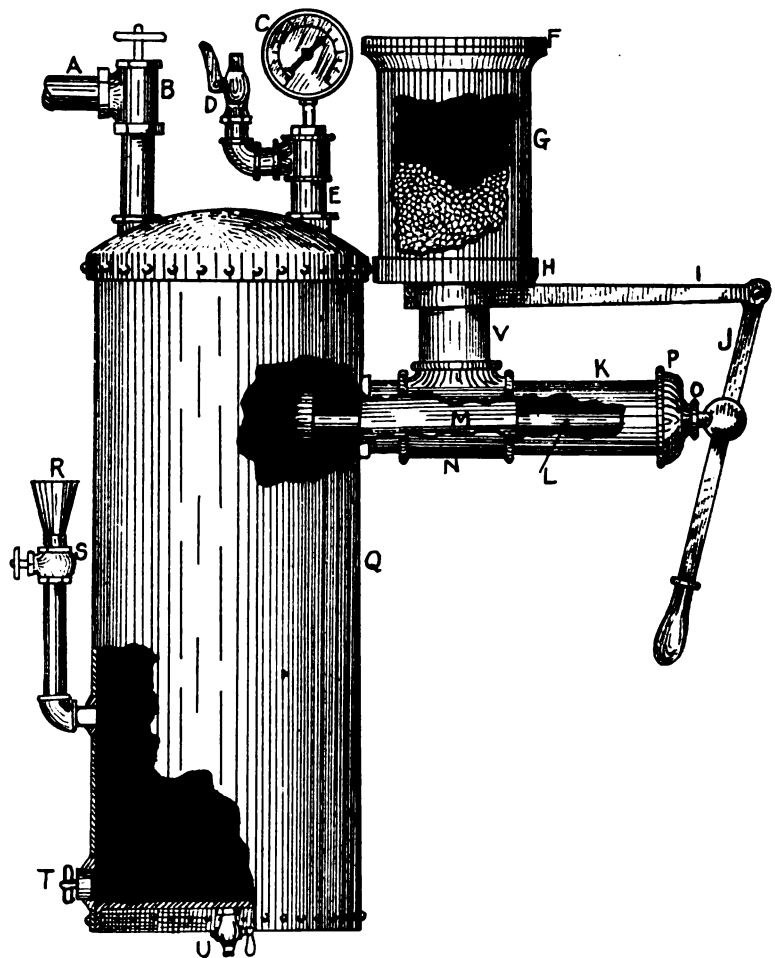


FIG. 1—THE ACETYLENE GENERATOR IS EASILY MADE

this object has been attained to some extent with the oxy-gas or oxy-hydrogen process, yet it has been found by trial that the oxy-acetylene process is the only satisfactory one. The main essentials are a very high temperature, perfect control of the gases, and facility of operation of the operator. With these qualities, success is sure.

that when smoothed down the joint cannot be discerned.

I wish to add here, by way of warning that, while the oxygen and acetylene process is not dangerous in a way, yet acetylene is an explosive, and the tanks used for generators must be tight and should be strong enough so there will be no danger of bursting, from the pressure. If new tanks are



used there is no danger, but some may want to use second-hand ones, so that this word of caution will, I believe, come in about right. Also in putting the joints in the pipe, the threads should all be good and well coated with a mixture of litharge and glycerine. They should also be screwed up tight, as any leaks, especially with the acetylene, might cause a very serious accident.

With this warning I will first take up the making of the acetylene generator.

To make the complete acetylene generator, Fig. 1, you will need the following material:

- 1 ordinary stove or range boiler (A)
- 12 inches in diameter, 60 inches high
- 1 $\frac{1}{2}$ -inch angle needlevalve (B)
- 1 short piece of $\frac{1}{2}$ -inch standard pipe, about 4 inches long, threaded on one end
- 1 steam gauge, 60-pound (C)
- 1 $\frac{1}{2}$ -inch pop safety valve (D)
- 1 piece $\frac{1}{2}$ -inch pipe, 20 inches long, threaded both ends (E)
- 1 5-inch plate (F) and flange with bolts
- 1 piece of 5-inch pipe, 14 inches long (G), threaded both ends
- 1 5-inch malleable cap (H); tapped for 2-inch pipe
- 1 piece of $1\frac{1}{2}$ -inch by $\frac{1}{4}$ -inch iron to make yoke for lever (I)
- 1 2-inch nipple, six inches long (K)
- 1 piece of $\frac{3}{8}$ -inch rod, 14 inches long
- 1 lever (J)
- 1 piece of iron just large enough to fit inside of 2-inch pipe and 6 inches long (M), also a small disc, same diameter, to make feeder
- 1 packing gland (O)
- 1 2-inch malleable cap, with hole tapped out for feeder rod to pass through (P)
- 1 small funnel with $\frac{3}{4}$ -inch coupling soldered on (R)
- 1 $\frac{3}{4}$ -inch Globe valve (S), also 1 piece of $\frac{3}{4}$ -inch pipe, 18 inches long, threaded at both ends, also 2 close nipples and 1 elbow
- 1 2-inch plug (T)
- 1 $\frac{1}{4}$ -inch drain cock (U)
- 1 2-inch nipple, 6 inches long (V)
- 1 2-inch T (N)

This makes all the necessary material. In one of the top holes of the boiler screw a piece of $\frac{1}{2}$ -inch pipe, 6 inches long, and on top of this the angle needlevalve (B). Then the short piece of pipe (A). This is the outlet for the acetylene gas to the torch.

In the other hole screw in the piece of 20-inch pipe (E); on the top of this pipe place a T as shown in Fig. 1, then put on the gauge and safety valve.

Then about 6 inches from the top of the tank (Q) tap out a hole for a 2-inch close nipple, screw in the nipple and then screw on the T (N), and then the 6-inch nipple (K).

ing bonnet, nut and all, from an ordinary 2 or 3-inch globe valve.

Flatten out the end of feeder rod (L) and make an eye in it to bolt on handle (J). Place the threaded end of feeder rod through the packing gland, and then screw on the feeder and put it together as shown in Fig. 1. Then make the yoke (I) and connect up as shown in Fig. 1.

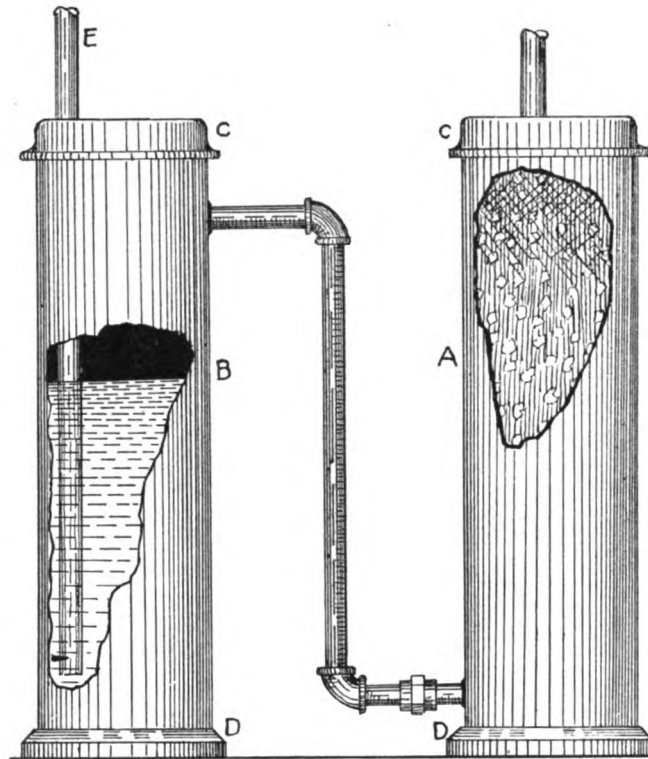


FIG. 2—THESE PIPES ACT AS A FLASH-BACK ARRESTOR

Then screw in the other 6-inch nipple (V) at the top of the T, and on top of this screw on the 5-inch malleable cap (H). Then screw in the 5-inch piece of pipe (G) on this, first screwing on the flange at the top. This completes the carbide hopper.

Next, to make the feeder, take the piece of iron (M) and drill a hole about 1 inch deep in each end and thread it for a $\frac{3}{8}$ -inch rod. Then take a piece of $\frac{3}{8}$ -inch rod, about 3 inches long and thread each end. Screw one end in the iron (M) and the other end in the disc. This leaves a 2-inch slot between the disc and end of the iron. Then take the piece of $\frac{3}{8}$ -inch rod and thread one end and screw in the other end of the iron (M) and your feeder is complete.

Next, take the 2-inch malleable cap (P) and drill out a hole large enough to put in the packing gland and nut.

The packing gland may be made, but can be easily procured by remov-

Then in the hole in the bottom of tank put a $\frac{1}{4}$ -inch drain cock (U). Near the bottom of the tank, tap out a hole for a 2-inch plug (T). This hole is for cleaning out the residue that comes from the decomposition of the carbide.

On the side of the tank and about 16 inches from the bottom is another hole. In this hole screw a close nipple. On the nipple screw an elbow and then a piece of $\frac{3}{4}$ -inch pipe, 8 inches long. On this put a $\frac{3}{4}$ -inch valve and the funnel on top of this. The top of the funnel should be about half way to the top of the tank. This is for filling the tank, which should be kept about half full of water.

This completes the acetylene generator and, if all joints were properly put together with litharge and glycerine, there should be no leaks, whatever.

To work the generator, first set the safety valve so that it will pop off at about 35 pounds, then fill up



the carbide hopper with calcium carbide. The $\frac{1}{2}$ -inch feeds the best. Then cut a rubber gasket to fit the plate (F) and bolt this plate down tight. Then fill the tank half full of water and close valve (S) tight. See that angle valve (B) is shut. Then pull feed lever (J) out. This allows the slotted part of the feeder to come exactly under the 2-inch pipe from the carbide hopper. Then pull the lever back and this pulls the feeder in the position as shown in Fig. 1, allowing the carbide that is in the slot to drop in the water. The proper working pressure for welding is five to fifteen pounds, and the safety valve set at twenty pounds above this amount prevents any loss of gas and at the same time takes away any danger of bursting the tank. A few pulls of the feed lever will bring up the required pressure and then an occasional pull will keep it up, as the gas is being used out.

If preferred, presto-lite gas tank may be used for the acetylene instead of making the generator, but I believe, after having tried both, that the generator is the best and far cheaper. If the T (N) is filled in some way so as to make it perfectly level between the nipples it is much better. The writer used lead or babbit for this purpose.

This is a complete description of the acetylene generator the writer has been using for over six months and can do any kind of work that can be done with any thousand-dollar outfit on the market.

A great many persons are afraid of what is known as a flash back, or a case where the gas takes fire and might come back through the feed pipes

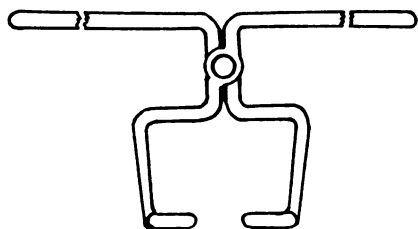


FIG. 1—THE CRUCIBLE TONGS

into the generator. While it has never been the writer's experience to have anything of this nature happen, or never heard of such an accident, yet I believe that it pays to be on the safe side. Fig. 2 shows a preventive for this. In case the reader wants to be

on the safe side, (A) and (B) are two pieces of 4-inch gas pipe, 18 inches long, threaded at each end. On the bottom is placed a flange with a plate bolted on, and the tops (C) are malleable caps. The tank (B) is kept about half full of water, and tank (A) is filled with a loose layer of large rocks, preferably limestone, and a small amount of calcium carbide.

The gas comes from the generator and into the pipe at (E), which goes down to the bottom of the tank (B). The gas goes out at the bottom and comes up to the top and out and down again to the bottom of tank (A). Then as it comes up through the loose rock and carbide, what moisture is in it is absorbed by the carbide when it is ready for the torch. A flash back in this way will never reach the generator, as it cannot pass the water. The drying cylinder (A) may be left off if desired, but I believe it makes a more satisfactory gas by being dried.

This completes the making of the acetylene generating apparatus. By studying the illustrations carefully you will have no trouble in making and using this generator.

We will next take up the making of the oxygen generator.

(To be continued)

Working Carbon Steel

The Furnace, the Bath, the Temperature, the Work—2

A. C. GOUGH, M. E.

In hardening tools and other articles not too large the lead furnace gives splendid results and is very convenient. Here the difficulties of getting an even heat are practically eliminated, the surface of the tool remaining perfect, as it is not in contact with the air and there is no danger of damaging the material as may be done by allowing it to soak in the forge fire. The furnace shown in Fig. 2 may be used as a lead furnace by employing a pedestal, as at 9, to support the crucible or metal pot, at 12, at some height above the coke fire so the lead may not become too hot. The pedestal, 9, may be built of firebrick or may be moulded of fire clay, the latter might be re-enforced by small rods and wire. The fire clay should be tamped into the mould with considerable pressure, dried slowly in the oven and brought up gradually

to the temperature of firing, though extreme care in making this is not absolutely necessary.

When the lead has become molten, the articles may be suspended by wires or otherwise in the crucible or

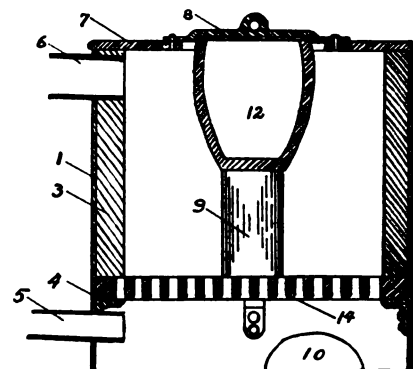


FIG. 2—THE CRUCIBLE FURNACE

metal pot, and when the lead and other contents have reached a cherry red heat the articles are taken out of the bath and chilled in water, oil, or otherwise, to suit the class of work.

It appears that the common type of muffle furnace is not designed for the repair shop, while the horizontal muffle is much better and more convenient than a muffle placed vertically, especially for tempering; the generally heavy walls of the muffle requiring considerable time for the heat to penetrate. This loss of time does not occur where the furnace has constant use, but in a general shop where a fire is not kept going continuously in the furnace the loss of time might be too great to consider it. It is hardly possible to make the walls of the muffle thin when it is constructed of fire brick, but a muffle may be moulded of fire clay, with some reinforcement properly proportioned and placed, which will stand much use when properly supported. If the muffle were placed vertically the matter of support would largely be eliminated and the thickness of the walls could be reduced.

The muffle shown, Fig. 3, may be re-inforced by some small rods, 4, connected together by wires, 3, after the manner of a squirrel cage; the rods, 4, being secured to the reinforcement of the bottom. A little graphite mixed with the fire clay will render the walls a better conductor of heat, and a little asbestos fibre will help bind the clay. The clay should be wet when working it with



sweetened water. The muffle, being left in the mould, should be placed in a very slow oven for a few hours until it is dry enough to remove the mould. After the mould is removed and the muffle is thoroughly dry it should be brought gradually up to the temperature of firing. Any cracks which occur in the walls during the first or subsequent firing may be filled with clay wash.

The work could be better and more easily handled if an iron mould were provided. But this method may be tried by constructing a wooden mould. It is believed that the mould shown in Fig. 4 offers the most simple construction. Here the outer and interior forms for the walls are in two parts, respectively, 1, 1, and 2, 2—the parts 2, 2 being secured by the large wood screws, 3. The mould may be held together by clamps.

The re-inforcement for the walls may be placed into the mould and the clay tamped around in place. At the proper time the re-inforcement for the bottom may be placed and secured, the rest of the clay being added. After the muffle has been finished and dried sufficiently the mould may be removed by loosening the clamps and screws, 3. In order to do this easily there should be some space left between the faces of the parts 2, 2 and they should taper slightly.

When in use the muffle may be placed in the furnace surrounded by coke just as an ordinary crucible. If it be desired to make the muffle of length sufficient to receive carriage springs, the furnace must be somewhat deeper than the common brass furnace. This may be provided for by excavating and making the furnace somewhat deeper than shown in Fig. 2.

The furnace shown here has the fault that it is somewhat difficult to remove the crucibles, but this may be largely eliminated by forming the tongs as shown in Fig. 1.

Early in the manufacture of steel, only small quantities were produced, which were made by putting lumps of wrought iron into fire-clay crucibles packed in with animal bones, hoofs, etc. The crucibles were then closed up with clay and brought to as high temperature as they would stand for several hours or days until the carbon of the bones, etc., had

entered the wrought iron, converting it into carbon steel. While the product of this method probably answered satisfactorily the purpose of those early days, it is not a uniform steel unless it be melted in a closed crucible and poured into ingots. However, the form of carbon which exists in bones, hoofs, etc., readily enters wrought iron at the temperature of a bright red heat and is used in certain commercial methods for case-hardening.

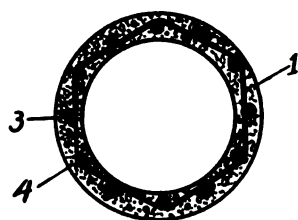


FIG. 3.

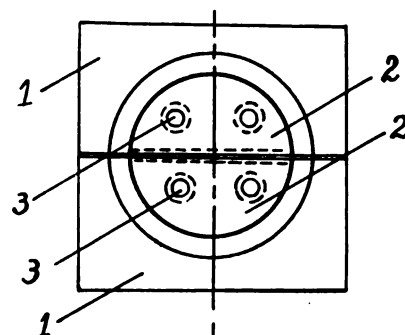
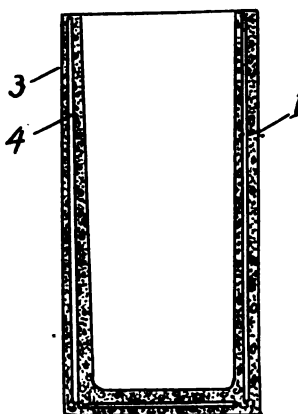
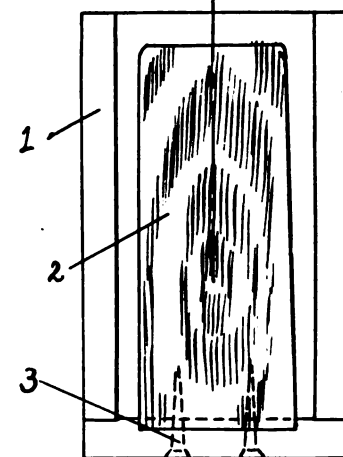


FIG. 4



AN EASILY MADE MUFFLE, MADE ON A WOODEN MOLD AND REINFORCED WITH WIRE

The shop which produces a considerable quantity of wrought-iron articles (not too large) will find that this method will produce commercial results: Using a furnace of the principle shown in Fig. 2; pack the articles in the muffle, 3, with bone carbon; raise the temperature to a red and maintain this for a few hours or more until the surface has been carbonized to the desired depth. When this condition has been obtained, the articles may be dumped out of the furnace into a vessel of water to harden the surface.

The cyanide process offers the most simple and convenient method of case-hardening when only a few

articles are to be treated; this consists in heating the iron to a bright red and then rubbing it with a lump of cyanide of potassium or ferrocyanide of potassium. It is again rapidly heated to a bright red and plunged into cold water. Care should be exercised in using this method, as the cyanide is poisonous.

There are necessarily many types of furnaces for drawing the temper of the numerous small and large steel articles manufactured. For manu-

facturing purposes, a muffle furnace provided with a thermometer to indicate the temperature within and means for adjusting the amount of heat supplied may produce good results. In some cases the temperature within the furnace may be regulated by a thermostat. But for the work considered here a short length of pipe closed at one end and used in connection with the forge fire, together with the muffle and furnace illustrated, have proved very satisfactory, except for tempering springs. When only a few springs are to be made, they may be tempered by the well known "burning-off process", which takes advantage



of the fact that linseed oil ignites at 600° F. The spring is hardened by immersing it in linseed oil. When the spring is cold it is taken out and the oil coating is ignited (by holding over a bed of coals, turn off blast) and burned off. This produces a temperature at least as high as 600° F., which will draw the temper of the spring. It is sometimes necessary to dip the spring and burn off, the second or third time—especially when it is thick. Care must be exercised to see that a much higher temperature than 600° F. is not attained, as the burning oil may get hotter than 600° F.—the temperature at which oil ignites.

For all parts of a tool, spring, etc., to have the same degree of hard-

ing that the oil has reached a temperature of about 460° F. The vapor becomes darker as the oil becomes hotter, and if the rod is watched it will soon show a brown color, indicating that the temperature of the oil is about 500° F. After awhile the vapor becomes black and heavy. If the rod be then held in the oil it will turn purple—temperature about 540° F. When the heat is increased until the vapor can be lighted with a burning stick, but may be blown out easily, it indicates that the oil has reached a temperature of 550° F., and will turn the rod a dark blue. This is the proper temperature for springs of low grade. When the oil boils over and the fumes ignite so they cannot be blown out it has a

How to Prepare Articles for Electroplating

A. H. WATCHOFF

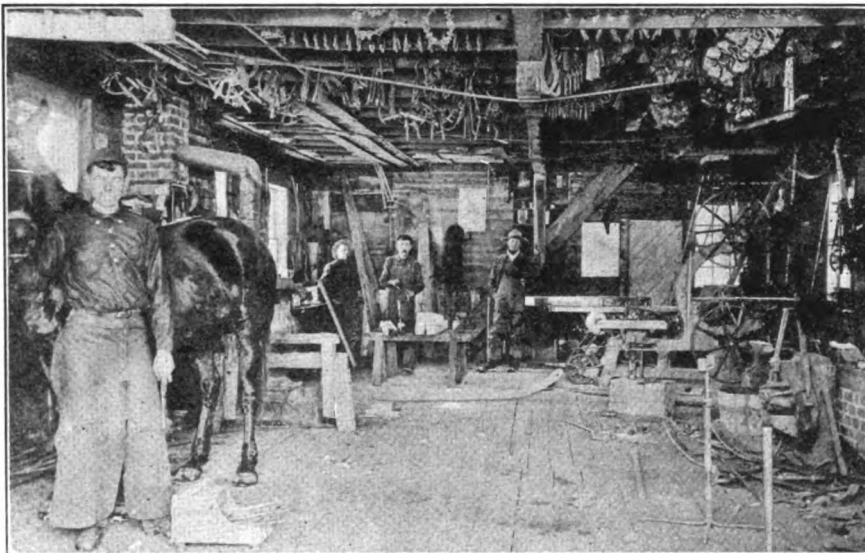
When the goods are received for plating it is necessary to have them perfectly clean, so that all parts will be exposed to the action of the solution. Every part must be perfectly free from any trace of foreign matter, in order to get a good plate. All of the rust, paint, grease or tarnish should be removed, and after the goods have been cleansed they should not be handled with the hands but by means of a copper wire tied to them. To clean off the grease, etc., they should be cleaned with a caustic cleaning solution, which is made by dissolving one half pound of platers' caustic in two gallons of hot water. The rust is removed by dipping in what is known as a pickling solution, which you purchase from platers' supply houses very cheaply. String the article to be plated on a wire, and dip in this solution, then brush with a wire scratch brush.

The old plate should be removed by a stripping process, which consists of dipping the article for about fifteen minutes in what is called "stripping acid." After this, the articles are again dipped in the platers' caustic solution, and they are then ready to be put in the plating tanks. All iron, steel, etc., should be slightly copperplated at first, in order to make a better nickel job. It costs almost nothing to copperplate. Turn on the current and leave in the copper solution for fifteen minutes. After the necessary plate has been put on, the goods are removed from the solution and rinsed in hot water, then placed in a box of hot sawdust to dry. The same method applies to all of the different kinds of plate. After the goods have dried they will be of a dark, dirty color, but when polished up they will look fine.

The plating itself is a very easy process, very cheap and simple. The main thing is to use care and to have the articles free from all dirt and grease, and you are sure of a good job.

This is a branch of work that every blacksmith should take up. There is no town so large nor none so small but that there is money in the business.

The polishing is done with hand buffs made of cotton flannel or with buffing wheels which are used on an



THIS COLORADO POWER SHOP IS RUN BY CARTER & TURNBULL—
THEY DO GENERAL WORK

ness, all parts must reach the same temperature. This is not possible when heating in the open air. The tongs, a draft of air and many other causes may prevent the desired even temperature. But if the piece is put into some liquid heated to the desired temperature it may be heated evenly throughout and will be protected from all external influences. Linseed oil is generally used for this purpose.

The pan of linseed oil is usually supported directly over the fire, for drawing the temper of tools. The temperature of the oil may be ascertained by dipping a bright, polished steel rod into the bath. When the oil gets hot enough for a white vapor to begin to rise, the rod dipped into it will turn a pale straw color, show-

ing that the oil has reached a temperature of about 600° F., which will turn the rod a lighter blue. This is the proper heat for high grade springs.

When preferred, the pieces to be tempered are plunged into the oil which is kept at the proper temperature necessary to produce the desired degree of hardness. But since the heat contained in the pieces which are put into the oil tend to raise the temperature the thermometer must be closely watched and the gas flame or source of heat closely regulated. A large oil bath may be used, which eliminates this trouble to a great extent.

NOTE—This is the end of Mr. Gough's article on Working Carbon Steel which began in the June number.



emery stand. It does not require much polishing to bring out the desired result.

In silver plating, if the article to be plated takes on a dirty blue tint, it is a sign that there is not enough electric current, and the anodes should be moved closer to the articles being plated.

In the engravings, the three plating tanks are attached. Only one tank should be used at a time. Simply leave all the wires connected up, but do not place the anodes in any tank except the one you are using. Always cover up your tanks when they are not in use, to avoid dirt getting into them. Also, do not allow strong sunlight to shine into the solutions.

This I believe will enable you to do any kind of plating. Of course you will make a mistake or fail, occasionally—experienced platers do—but do not get excited and throw away your solutions. You will generally find that the trouble has been caused in preparing the work; and in a little while you will find it easy.

Toe Cracks, Their Cause, Effect and Remedy

DR. JACK SEITER

Large draft horses are predisposed to toe cracks for several reasons, chiefly among which are the coarse grain of the horn, weak walls and soles; these are inherited. Excessive hardness, overgrowth, long toes and low heels are caused by being shod. Long toes are to breakover on, and hard horn will crack or split when under a strain, instead of expand as nature intended it should.

Light harness horses, drivers and runners are liable to toe crack on account of contraction, dry and brittle feet, and too violent concussion as the foot strikes the ground while at full speed.

Shoeing unquestionably plays an important part in the creation of toe cracks, as I will try to explain: Excessive paring, thinning out the sole, cutting out the bars and quarters, rasping the outside of the wall, which weakens the structure—all have their bad results and pave the way for future toe cracks.

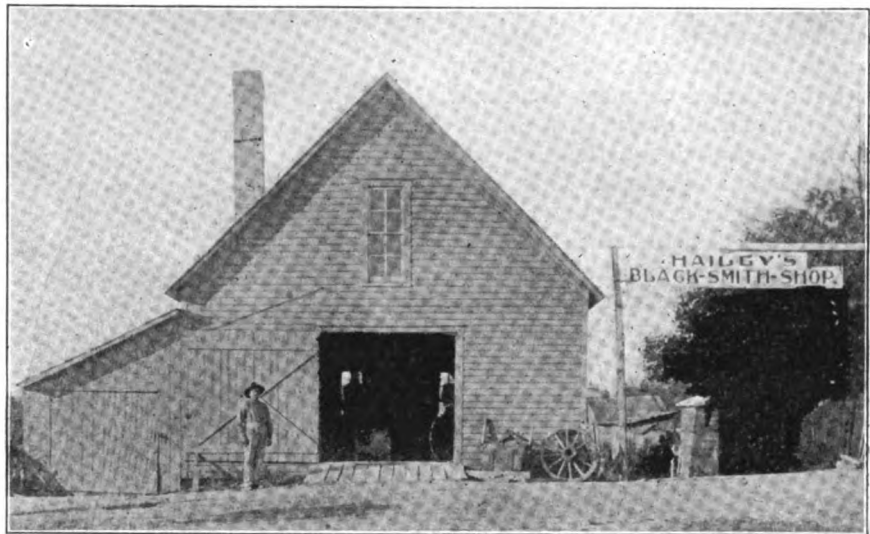
But the one thing that is the curse of our vocation—although we cannot get along without it very well,

especially in the big cities—is the toe clip. It's as dangerous as a gun in the hands of the careless; but we must have it—there is no way to taboo it.

We must all admit that a foot that has been pared about as low as it will go is a bad subject to burn a big red-hot clip into, especially if it is not used properly. By this I mean that in the majority of cases, be it through ignorance or carelessness, the clip is let into the wall too far. We often see shoers go to a foot to fit a shoe and with a pair of nippers bite out a piece of the wall from one half to an inch in depth, and then sink a red-hot clip into it. The clip is not properly built and the shoe not fitted

There is iron underneath the foot, iron in front of it, and we employ a steel hammer to beat them together, regardless of the fact that there is only living tissue between to stand the pressure. There is an old saying—"When an irresistible body meets an immovable force, what happens?" I don't know, but it's a cinch that, when two such bodies meet a forceless force, something has got to back up or give, and in this case it's the horn and its underlying tissues.

After a few shoeings like this, we begin to see our damage, at first it's generally only a small, black semicircle at the site of the "white line." This gradually turns into a slight separation, and eventually it will



AN ILLINOIS GENERAL SHOP RUN BY MR. J. H. HAILEY

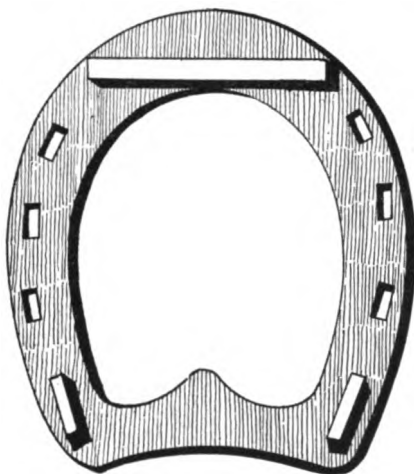
as it should be. This no doubt makes it necessary, in order to get the shoe back far enough so as to get a solid hold for the toe nails, or maybe to make a short shoe fit a foot that is several sizes too large for it.

In cutting or nipping out this piece we destroy the strongest portion of the foot; in fact, the piece we often see taken out to the "white line" is really the thickest and strongest part of the whole foot, and just where we need the strength most. Then to fit a hot clip into it and probably push and bear onto it to make it fit still deeper is certainly bound to do some harm and damage to the sensitive structure of the hoof. But we nail the shoe on and clinch it and then, to finish off, we pound the clip still deeper into the poor, mutilated foot until the poor dumb brute signals "enough", by holding up his foot in mute appeal.

resemble a "seedy" toe. At this stage the wall may still appear as though it were perfectly sound at the outside, but it is undermined, weak and brittle.

Now when the next set of shoes are fitted and applied, and the clip is driven in against this brittle and weakened wall, the damage we have done becomes apparent; for after this we notice a slight seam or crack—maybe only a fraction of an inch—on the outside of the wall, but no telling how far up it may extend on the inside (between the horny and sensitive laminae). This crack gradually works its way up, as the animal exerts itself in its daily toil, and finally the day arrives when the horse goes lame.

On examination we find the coronary band involved, the inflammation set up causing the sensitive tissue to separate from the horn, and now we



THE BAR SHOE FITTED WITH
THREE CALKS

are in trouble. If we do not pare away the loose horn from the affected part the tissue will naturally become irritated and enlarged, and hang down over the affected coronary band and the hoof, and at every move of the foot the sharp edge of the horn will be driven up and into it. This is the way an ill-fitted toe clip may be the direct cause of a toe crack.

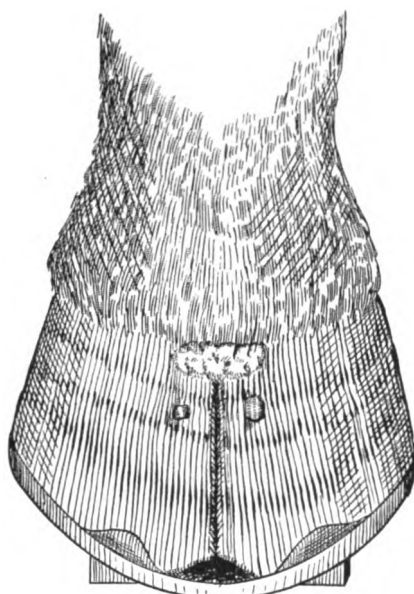
Some cracks are caused by contraction, and in this case the crack appears, primarily, at the coronary band. In speed horses it may burst open at any time during violent exertion; runners and jumpers have been known to spring a toe crack at one jump.

When we get a case of this kind it usually is in a bad state—covered with blood and filth and, of course, very sensitive to the touch, foot overgrown, shoe on for some time, foot very feverish and, consequently, hard, and the animal will probably walk better with the shoe on than with it off, at that.

My procedure, generally, is as follows: Advise caretaker to give the foot a thorough washing with warm water and soap, to which some antiseptic has been added. When the foot is perfectly clean, a good thick "swab" of either warm or cold water should be applied around the coronary band; this will allay the inflammation and also soften the horn so that we can work on it.

After this treatment have the animal brought to you. Now remove the shoe and trim off all the superfluous growth and shorten up the toe all it will stand. If it is a flat foot and the toe is dished, stub off some of it; the shorter we can get the toe the less leverage and consequent strain

we will have to contend with. Now take a fine, sharp hoof knife and start to pare away the horn immediately underlying the coronary band. This is a very painful procedure, and we must be careful and not attempt to cut out too much at a time, but just take a small shaving at each cut. It will appear as though the horn were jammed away up in under the coronary band, and the tissue being swollen and greatly enlarged naturally hangs down over the horn. Of course this gives it a rather abnormal appearance, but with a little patience we can readily separate the parts. After all the sharp edges have been removed we can proceed downwards. Cut out any more of the horn, in half-moon fashion, that may be necessary, in order to keep it clear of



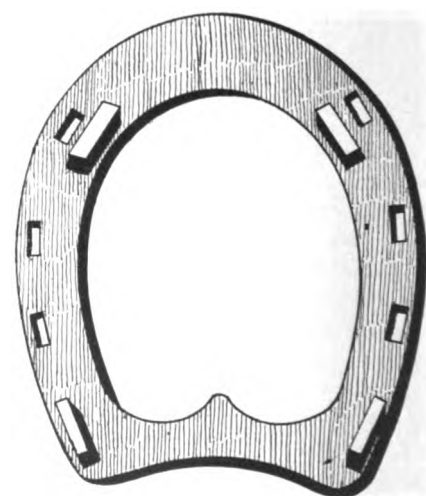
HOW THE TOE CRACK APPEARS

the band. We often find that some foreign matter has worked itself into this space, between the horny and sensitive laminæ. Filth, sand, or probably hair, keep up a constant irritation and consequent inflammation, and this must be cleaned out or we cannot expect to have success with our treatment.

Now as to shoeing. It naturally depends a great deal to what use the animal is put. If it is an ordinary road horse or driver I would advise the use of a plain bar shoe of fair weight and a well-rolled toe, rolled to a feather edge. Also employ two side clips—between the two toe holes will be about the proper place for them. If the heels are very low, a side calk may be employed, set well to the

front, to assist in giving more roll to the foot. In case of heavy drafters, where we probably must use a toe calk, this is a different proposition; but I find that by applying a bar shoe with clips as above we can do fairly well by setting our toe calk well back to the inner web of the shoe; having it just high enough to prevent the animal from breaking over the point of the shoe. This calk may be set similar to a "Memphis bar," and the point of the shoe can also be rolled—anything to keep the breakover and strain away from the point of the toe and the crack will help. A four-calked shoe is also indicated here, as it gives the required roll. We can regulate the angle of the foot with the heel calks. If the heels are low, have the heel calks high enough to offset it; but this depends entirely upon the shape of the foot and the limb and is best left to the operator's judgment. A leather pad and packing should also be used. I cannot advise the use of tar in a case of this kind on account of its heating effect. We already have too much heat and inflammation.

When the shoe is ready to be applied, see that it fits snugly all around and, just before driving it onto the foot, ease all the bearing from the crack that it is possible to do; this should be cut out as a semicircle or half-moon. After the shoe is applied, tap your clips gently until they fit snugly to the foot. Then drive a nail through the crack to aid in binding both sides together. This and the clips will make it impossible for any play between the parts, and by steadying a foot in this fashion we derive a new growth at the coronary band. This growth is very weak at



THE FOUR-CALKED BAR SHOE

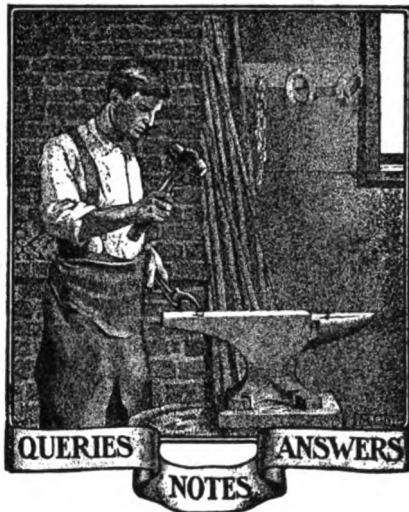


first, and for that reason must be protected, at least until it has grown half way down the foot.

Putting this nail through a crack is sometimes a very delicate operation, especially where the soreness is great, but with a little patience and practice it becomes rather simple. With a sharp knife cut a small notch about one inch to the side of the crack and about the same distance from the coronary band. Then heat a pointed piece of steel and burn a small hole in the groove towards the crack. This is to start the nail in. Now take a small nail and proceed to drive it through the crack. You may have to pull it several times to set the point of the nail so that it will come out just right. Try to have it come out about the same distance from the crack as where it entered. Then draw together well and clinch.

Next fill up the crack with some bland, non-irritating material, such as beeswax, tallow or vaseline. This may be touched up with a hot iron to drive it well into the crack. Put a layer of cotton or oakum over it and bandage to keep the material in place and foreign matter out. Adhesive or electric tape is very useful, as it has a tendency to protect the parts and also has a binding effect that is a great aid in keeping the foot together. A mild blister is also indicated around the coronary band. It stimulates a new growth of horn, without which we can hardly expect success. A week or two of rest is also of great benefit after being shod in this manner. Naturally, the more rest the better; but it is not absolutely necessary to lay an animal up at all in most cases. Care in keeping the parts clean, the hoof soft and growing (with the aid of swabs), preventing excessive growth of horn at the toe and frequent resetting of the shoe are the main objects to keep in view.

Examine often and be careful not to let the new growth of horn come in contact with the old portion—keep them separated by frequently trimming out the old parts, but never interfere with the new growth. Also keep the notch at the toe well pared out. Would advise the use of side clips, even after the crack has grown out entirely, as the forced growth of new horn may not be quite dense and strong enough to stand the strain unassisted until it probably derives its second growth.



Two Questions.—I would like to know of a simple way to forge the iron connecting rods for a mower machine as shown in the accompanying engraving. Also, will you kindly tell me what to do with a set of traction lorry (truck) springs that have been flattened from overloading. There are eleven plates, $2\frac{1}{2}$ by $\frac{3}{8}$ inches.

THOS. R. GRETTON, England.

Wants Price Lists.—I think your paper is fine for the trade. It has been a great help to me, and I believe it would be still more of a help to all of us if the different prices of work were given. This would enable us to know the leading prices received for work in different countries and would bring us closer together in observing a uniform price; and would perhaps discourage so much price-cutting. I think the articles on horseshoeing very good.

JAMES BOND, Kentucky.

Wants to Make Stocks.—I would like to know through the columns of your paper how to make a pair of stocks to hold vicious horses while I am shoeing them.

C. F. RICE, Iowa.

For Toeing Out.—If Mr. J. E. Mayhue of Oklahoma, whose horse "toes out", will take one half of an old shoe and weld it on the inside of the animal's shoe his horse will not interfere. If the horse is "reel-footed", put it on the outside.

J. B. PRIDDY, Texas.

On Plating and Brazing.—I would like to ask your readers for the following receipts:

A receipt for making a nickel plating dip, such as mentioned in THE AMERICAN BLACKSMITH. Also a receipt for brazing cast iron. Any information will be very much appreciated.

BERT C. LESTER, Nebraska.

Several Questions that Puzzle.—I would like to ask through the pages of your journal the following questions: (a) Will someone kindly tell me how to cure corns on a horse's feet? (b) What is the cause of wind galls on a horse's legs, and what is the best method to remove them? (c) Which is the best weld to join an automobile spring? (d) What is the best compound for welding a spring?

W. M. MILLS, Texas.

Tires Crumbling.—In answer to the brother smith who asked what was the trouble with his tires: While he could set them all right, when he came to weld them they went to pieces. My opinion is they are of some grade of mild steel and he gets them too hot, burns them, in fact. Try some good welding compound and do not heat so hot, and I believe he will have no trouble.

H. N. POPE, Connecticut.

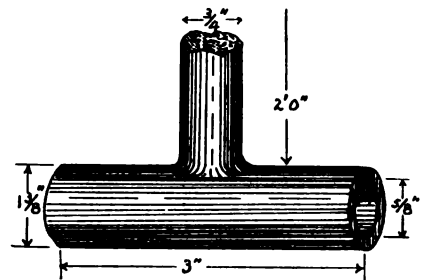
Stomach Trouble.—"Our Paper" is O. K. My wife says that I wouldn't eat my supper until I have read every bit of it when it comes. I find in THE AMERICAN BLACKSMITH some very good receipts, and I wish that some brother would give me a receipt for stomach trouble. I have been a sufferer for years and don't seem to get much relief from the doctors. I happened to think that some brother might know of a good remedy. J. L. LESTER, Missouri.

A Puzzling Case.—A ten-year-old mare was brought to my shop about three months ago. In examining her feet, preparatory to shoeing her, I found a diseased place on the inside of each one of her feet. It looks like a corn, but it is too far forward—too far from the heel. It is about midway between the heel and the toe. I think it is a bruise, but the owner thinks it was caused by standing on hot manure. The animal is lame and I have gotten several creepers out of her hind feet. The hoof has an offensive odor, so I packed her feet after bathing them with spirits of turpentine. I would be glad to hear from readers of "Our Journal" with regard to this case.

JAMES BOND, Kentucky.

To Weld Copper.—First of all, take your copper and get a good clean ashwood fire, a wooden block and a wooden hammer or mallet, as some smiths call it. Heat and work your copper away from metal just with your wooden tools. The block I mention answers for an anvil.

C. R. KEMMERER, Pennsylvania.



HOW WOULD YOU FORGE THIS?

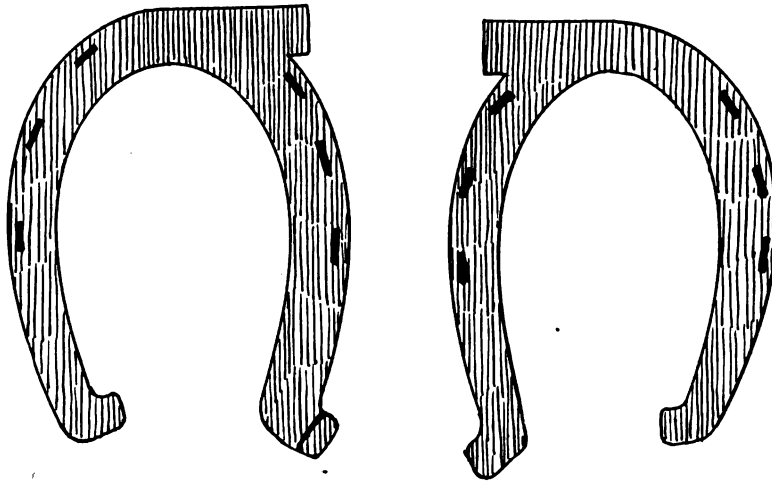
On Business Management.—I am very glad you have taken up the vital matter of managing business for profits so seriously. Blacksmiths seem to be made of the same kind of stuff all over the globe. As a rule, they are honest, hard-working men, but weak business managers.

To run a business for profit, I suppose one needs to be a bit of a Jew; as a good Christian is not supposed to accumulate worldly riches, but to labor and die for the welfare of his friends and neighbors.

Now, I consider the best safeguard would be a course of about twelve months to get a business education before going into business for yourself. Managing a business is an entirely different occupation and training from smithing and is quite essential to success. But how few blacksmiths ever think of such a training; to many of them it would seem like wasting time and money; the latter being generally scarce at the time of their starting out in business.

I know of blacksmiths who have covered a row of golden years, who at times had six to ten men working for them and made their own prices in everything. Now they are doing business with only one assistant, or a boy, and just about make ends meet.

Then, again, some blacksmiths are too comfortable or too narrow to take up a



SUGGESTIONS FOR SHOEING THE INTERFERING ANIMAL

side line in spare time and when business is dull; they prefer to wait for a job to "turn up." OTTO TIERZ, South Africa.

Shoeing the Interfering Animal.—As to shoeing interfering horses, they generally interfere behind if they interfere in front, and I use the same method. I have never seen a horse interfere in front that toed in, because they generally toe out. The hind feet are different, generally toeing out, but occasionally they toe in also.

My idea is to brace up the inside of the foot where they toe out by having the heel calk and toe calk higher on the inside, allowing the toe on the inside to be set inward. Don't curve the inside calk round under the foot. A horse shod this way will throw his foot out in passing his other foot.

T. B. SMART, Missouri.

Hot and Cold Setting.—I have been a reader of THE AMERICAN BLACKSMITH for some time and have read with interest the different articles from brother smiths, and I thought it was time this section of Missouri was heard from.

As to cold tire setting I have a Brooks cold tire setter and also a good hot tire setter. I find that all tires cannot be set cold satisfactorily, but if the wheel is good and the tire good, but the tire is getting loose enough to rattle, I can do a good job cold. Sometimes a wheel is rim-bound but otherwise in good condition, and in this case I take off the fellow clip, saw through the fellow until the fellow rests down firmly on the spokes with a little disk. I then set this cold. But if a wheel is too loose and spokes rattle so as to need wedging, or the tire is worn to a thin edge, I set them hot. We get 50 cents a wheel for hot setting, and 40 cents for cold. T. B. SMART, Missouri.

A Teacher on Hot and Cold Setting.—I've been reading your journal for eight or nine years and think it O. K. I think the shop pictures inspire the brothers as much as any feature.

In regard to cold tire setting I will say that I doubted the work of them at first; that is, before I actually handled one. But I have long since concluded that, after all, it is the man with the machine and not the machine with the man. The machine will not work itself. We sometimes expect too much of a machine. It is hardly wise to try to reset with a machine a tire that should be in the "junk."

Take a tire that is loose—as they usually come to a first-class shop. A mechanic and a machine will do a first-class job, as may be tested by sight and the old reliable hammer test. Any real smith can hit on a tire with

a hammer and tell if it is tight; isn't that the way we really tell after all?

When we heat them to put on and while setting up the tire if it doesn't sound right we know it isn't going to come out right, and, while we let it cool—hoping it may by some hook or crook come out right—yet the chances are we will have to ease it off and give another pull.

The sound never fools a smith; shrink one in good faith and sound it. I've been following the trades for nineteen years, teaching the trades about half of the time, teaching manual training, chemistry and physics.

J. B. BRAGG, Mississippi.

Welding a Mowing Knife.—I have often thought that I would write an article for publication, as I think that every subscriber owes this to "Our Journal," but it seems that I never get at it. Herewith I shall endeavor to tell of one way of welding a mowing machine knife which I find works very well and saves time. First, remove the knife head and sections in the usual way, then mark with a center punch on each side of the break and set the dividers to the marks to give the right length. After welding I scarf both pieces and punch a hole in each piece and rivet them together, using a 13-64 mild steel rivet and one with a large head. The rivet makes up for stock used in welding, and one weld does the job; otherwise it takes two. Of course I upset the pieces before scarfing.

J. W. IVIE, Utah.

Piston Rings and Shoeing Prices.—I want to give the boys a little tip on piston rings for the gasoline engine. I sent to the factory for a set of rings, and while the new ones were coming the thought struck me to spread or make the old ones larger, as the old rings were worn out. I tried it with a very light pene hammer, set the ring on the anvil, gave a tap on the inside of the ring a few times and had a nice fitting ring; one that is already fitted to the engine. With new rings, as is known, the rings must wear to fit the engine.

Well, the boys are not saying very much about the lien law. Now, I don't need any lien law. If I don't know a man is good he won't get his work. I have one man who owes me \$2.15, but he won't pay; so when he wants more work done I am too busy to accept his work, because I don't want to take any more risks with him. The other smiths in this place came and asked me if I would raise on horseshoeing and get \$3.00 a span. I told them that I was charging \$3.00 a span. So now we have a uniform price on shoeing. We charge twenty-

five cents for toeing, and twenty cents for sharpening, old shoes. We are also trying to get plow work up a little. Prices are too low in accordance with other things. All of the farm products are high; so why should not the smith have a little raise? I would like to touch the boys up on shop insurance next month.

O. R. MANVILLE, Missouri.

A Shop-Made Tractor Saw Outfit.—This is my second letter to "Our Journal," but I am interested in some of the fine talks on different kinds of work, especially on tire setting and shoeing. There is a great deal of that kind of work to do in Texas in the spring and summer months. We get from \$1.00 to \$1.50 for shoeing and from 50 cents to 75 cents per tire for setting tires. I have a hot tire setter and can do the work that any of them can do with their cold tire setter. I have a well equipped shop with a 3 H. P. gas engine, a trip hammer and a hand saw, turning lathe, power blower and emery stand and all the smaller tools a man needs.

I have recently built me a wood sawing outfit, and I can put my engine on it and send it all over town, sawing wood. It is rigged to pull itself on the road. It is a handy outfit.

First I took four old buggy wheels and cut off the spokes or cut them down to 24 and 20 inches, sawed out wheels the size of 2 inches wide and 1½ inch deep, put on a good wide tire, took the old axles and cut out 22 inches and welded them back, making it about 40 inches wide; then I got two 4 by 4's, 9 feet long, and made a frame. Then I run a rod from one side of the front axle back to the steering gear just in front of hind wheels. Then I set my engine on the front end and bolted it to the frame. I put in a countershaft with a big 16-inch flanged pulley, also had a 5-inch flanged pulley on the engine. I run my belt loose on these pulleys. I have an idler to work with a ratchet lever so as to tighten the belt; there is a 4-inch chain sprocket wheel on the ends of my countershaft and a 12-inch sprocket on each hind wheel. I run a No. 45 chain on them. I can start my engine and get on and tighten the belt with the lever and she walks right off with ease.

J. H. REDDELL, Texas.

A Letter from Georgia.—I take more pride in shoeing than any line of work, although we do all kinds of repair work and do the blacksmithing for several auto repair shops, such as welding springs, axles, rods and various other things. In fact, every little "Japanese Puzzle" that the auto repair man can't unravel he brings to us.

Prices are very low here, but we have a little the best prices in our community. It seems almost impossible for us to work an extra blacksmith, though we pay a fair price. But if we get a man that we like, our customers don't like him, and especially a horseshoer. In the first place we can't find a man that can or will take the proper care in shoeing. First of all, we trim the feet and fit every shoe to the foot it goes on and level the foot carefully; then nail the shoe full size or a little larger and use a short clinch with tongs, and file off the clinches smooth and run the corner of the rasp around the edge of the hoof and shoe.

Our shop equipment consists of a 4 H. P. gas engine, a Star power hammer, two forges with hand and power blowers, a rip saw, a small jointer and a fair line of hand tools, blacksmith and wood tools. We have an open end iron shear of our own make. It is double gear with 8-inch blades made of old planer knives. It cuts all small rods and band iron cold and almost anything hot.

HUNT BROTHERS, Georgia.



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This Issue

This number features the canal at Panama, which is now nearing completion, not because the blacksmiths had so much to do with it, but because every man should be interested in this most wonderful undertaking. And if you are not now interested we believe that a reading of the feature article in this number will interest you.

An article to effectually and completely describe the canal at Panama would require an entire book; and every page of such a book would describe feats, marvels and undertakings that would seem really beyond the power of man to bring about successfully.

Just one feature of the canal—the dam at Gatun, for example—was considered impracticable by the world's most eminent engineers until they had been to the Isthmus and had seen just how that immense dam was built.

And so features almost without number may be pointed out. And as you proceed from one feature to another you cannot help but admire the minds who planned and then the men who worked out this Dream of the Centuries.

He Sold Out, But—

Here's a letter we received just the other day. Do you think it argues very strongly regarding the practical nature, regarding the interesting nature, regarding the real value of THE AMERICAN BLACKSMITH?

"Enclosed please find check for five dollars. This will pay my subscription up to March, 1923. I have sold the shop, but want the journal, anyhow, as I certainly enjoy it." E. E. LOWNSDALE, Missouri.

And you have to show Missouri folks, too. Yet "Our Journal" is showing not only Missouri folks but smithing crafters all over the world what a real live paper is and how really helpful a smithing paper can be.

Subscription Agents

When a stranger solicits your subscription to THE AMERICAN BLACKSMITH, or any other publication, insist upon his showing you absolute proof that he is an agent in good standing and is employed by the publication which he represents. Don't, under any circumstances, give the man your money if you are not sure that he really works for the paper he says he does. No matter what the man offers you—no matter what price he makes—no matter what premium he promises to send—DON'T GIVE HIM YOUR MONEY IF YOU ARE NOT SURE.

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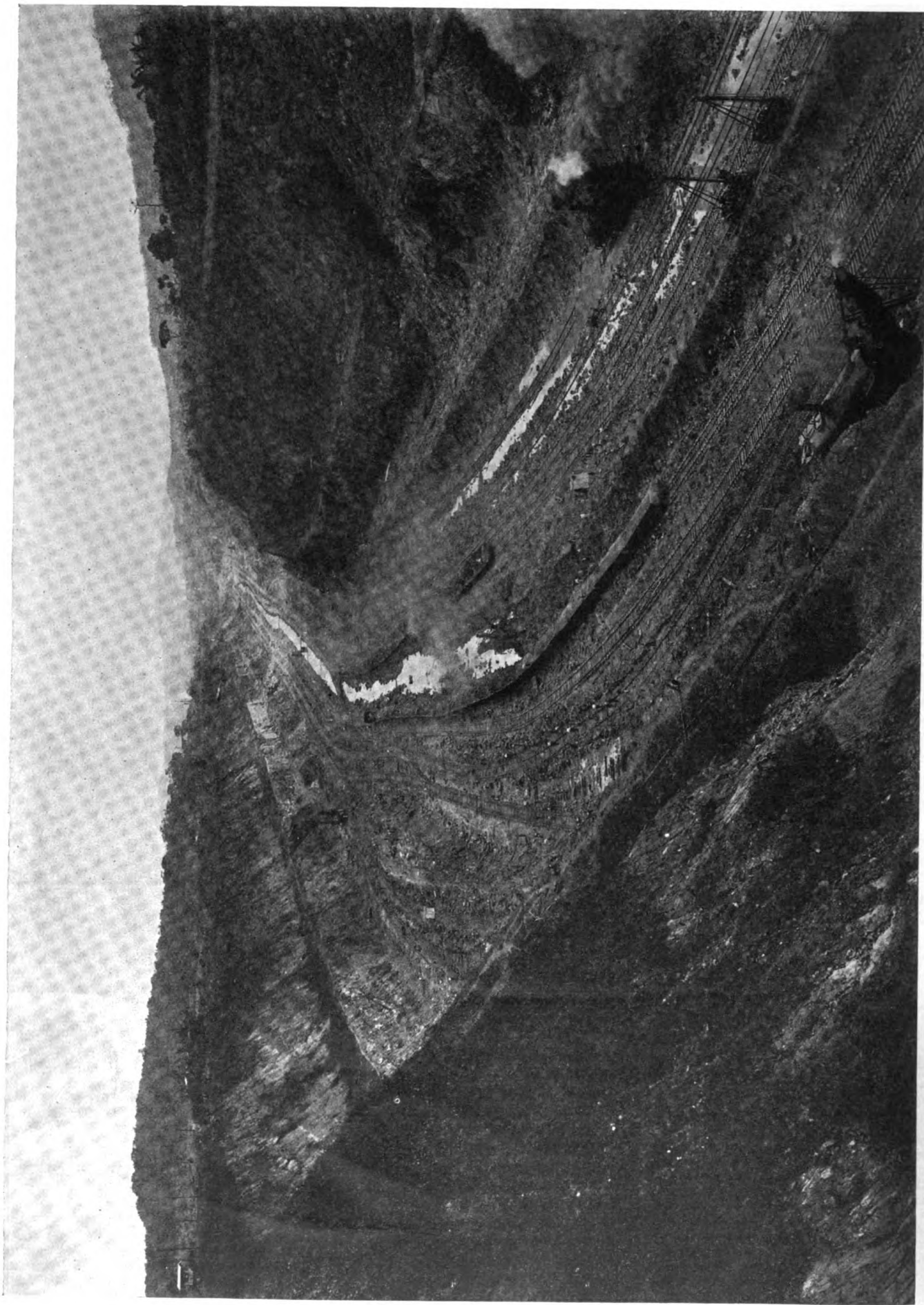
Elbert Hubbard

Who has not heard of Hubbard, the writer, the editor, the author, the Roy-crofter? He needs no introduction to you. And if you have never read any of his writings we are going to give you an opportunity to make up for the unfortunate occurrence.

Beginning with our next number, September, we expect to publish a regular monthly contribution by Elbert Hubbard, the well-known writer. These articles will be in this writer's well-known, straight-from-the-shoulder style, and will be on the subject of the value of "Our Journal" to readers, and how to get full value out of the paper from the advertising section as well as from the reading pages.

To say that this series of articles by Mr. Hubbard will be interesting goes without saying, and we know that you will want to read every single word of the entire series, which it is expected will run for a full year.

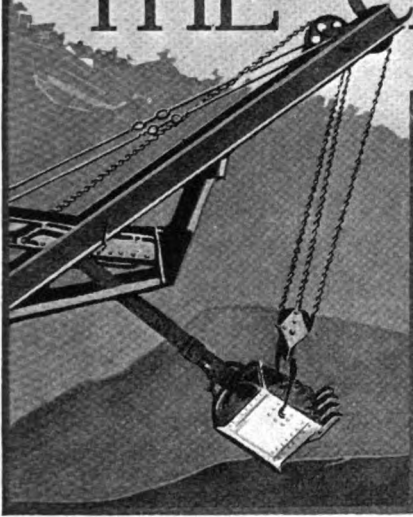
Tell your neighbor and then watch and wait for these interesting articles.



THE GREAT CULEBRA CUT AT EMPIRE. THIS VIEW GIVES ONE AN IDEA OF THE STUPENDOUS TASK AT THIS POINT. THE TWO STEAM SHOVELS IN THE FOREGROUND ARE SEEN WORKING ON THE FINAL BOTTOM OF THE CANAL



THE CANAL AT PANAMA



1529 a series of rough plans were made for a canal.

And now for almost four hundred years the canal across Panama has claimed the attention of men and nations with varying degrees of interest. To touch even lightly upon the history of those four centuries of struggle and vain effort would require volumes. Suffice it, then, to say that in 1902 the United States resolved to carry on the work of building the canal, and two years later, after all arrangements had been completed with the French company, Uncle Sam set his spade to work.

Probably the most important factor contributing toward the successful completion of the Canal under the supervision of the United States was the sanitation of the Isthmus, under the direction of Col. Gorgas of the United States Army. The work of stamping out yellow fever and malaria has been truly wonderful, and

the extermination of the mosquitoes, rats and fleas has been carried on relentlessly and with astonishing results. Such work has, of course, cost an immense sum, but the successful work of the sanitary corps has made possible the wonderful advances in the actual digging of the Canal. At present it is seldom that over two per cent of the working force are incapacitated by sickness of any kind, while in the old days as many as eighty per cent of the men were physically unfit for work.

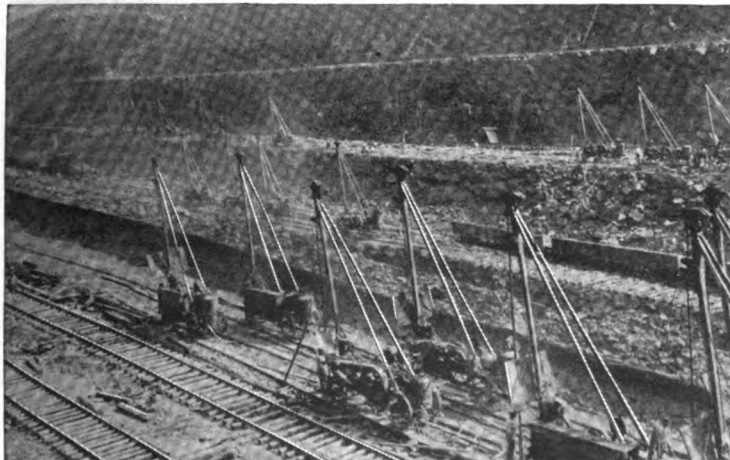
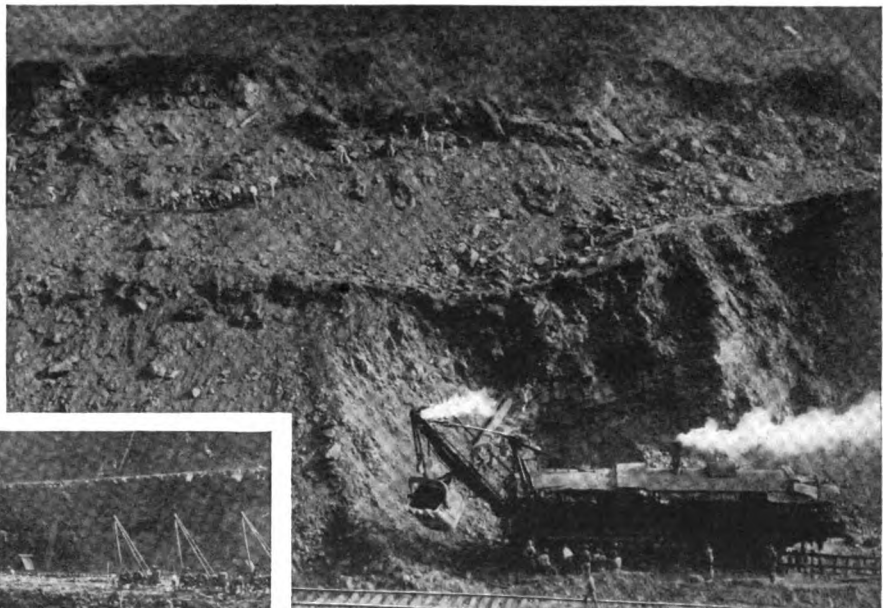
From the Atlantic to the Pacific

Possibly the best way in which to get an idea of the Canal at Panama is to take a trip from the Atlantic to the Pacific end, viewing as we proceed the various engineering feats and the colossal "stunts" which have been accomplished.

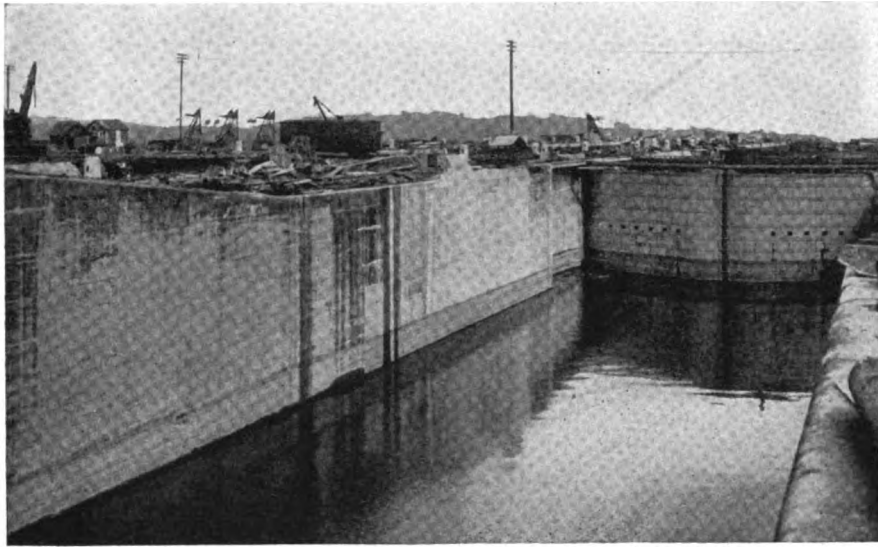
Supposing we are on a ship: we pass from the Caribbean Sea on the

WHEN the water flows into the Canal at Panama, and its gates open and close to the first ship, a dream of the centuries will have "come true;" and while the completion of this greatest of undertakings will be the realization of a centuries-old dream, its final accomplishment has required modern engineers, with modern machinery under the supervision of a modern nation that was yet unthought of when this dream of the centuries was born.

To find the birth of the canal idea—this dream of a new waterway to the East Indies—we gaze across the centuries and see the valiant Balboa viewing the majesty of the Pacific from the heights of the Panama Isthmus, and dreaming of a shipway from the Atlantic to the Pacific. Ten years later, or in 1523, we find Cortez investigating the feasibility of uniting the two oceans, and in



ONE OF THE LARGEST STEAM SHOVELS AT WORK ON THE CUCARACHA SLIDE. THIS SHOVEL REMOVES FIVE CUBIC YARDS AT ONE SCOOP. THERE ARE 15 SUCH SHOVELS AND 86 OF LESSER CAPACITY, MAKING 101 IN ALL. THE LOWER PICTURE SHOWS THE DRILLS AT WORK IN CULEBRA CUT. THE NUMBER OF DRILLS USED ON THE CANAL TOTALS 553. THERE ARE 196 OF THE MECHANICAL CHURN TYPE AND 357 OF THE TRIPOD TYPE HERE SHOWN.

*Photo by Underwood & Underwood*

THE EASTERN APPROACH OF THE GATUN LOCKS

Atlantic side through a sea-level channel, which is seven miles long, to the foot of the Gatun locks. Here our ship is raised through a series of three locks from sea level to the level of Gatun Lake which is 85 feet above. This lifting of a vessel is effected as follows: The vessel is towed into the first lock by electric

towing locomotives. The level of this first lock when the ship enters it is the same as the sea. After entering the lock, the gates are closed and enough water is admitted to the lock to raise the vessel to the lowest level of the next lock. When raised to this level, the gates are opened, allowing the vessel to pass into the

second lock when it is again raised until on a level with the lowest level in the third lock. When the third lock is entered the ship is raised finally to the level of the lake.

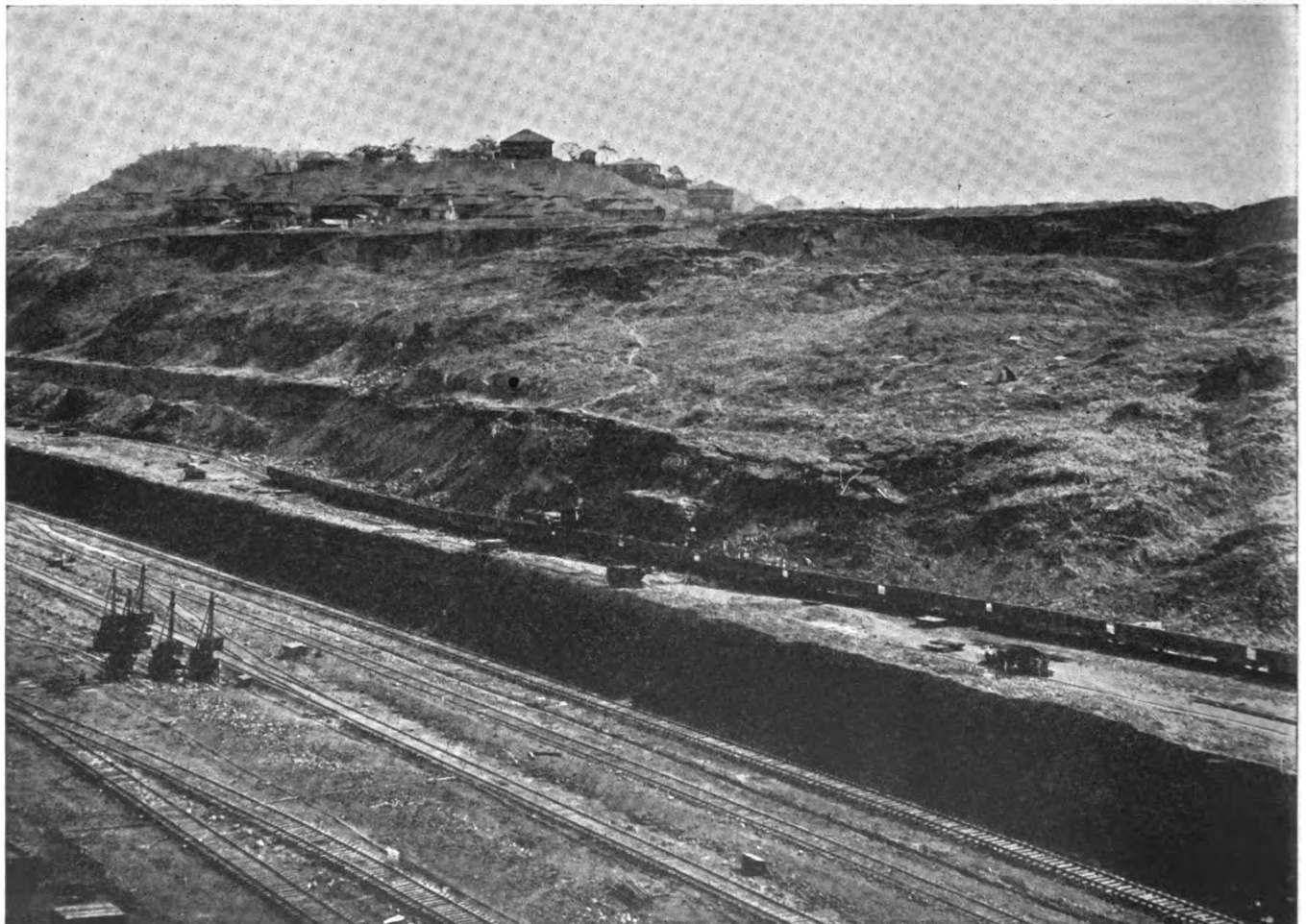
At Gatun

We are now on Gatun Lake, which was formed by the Gatun dam, thus impounding the waters of the Chagres River.

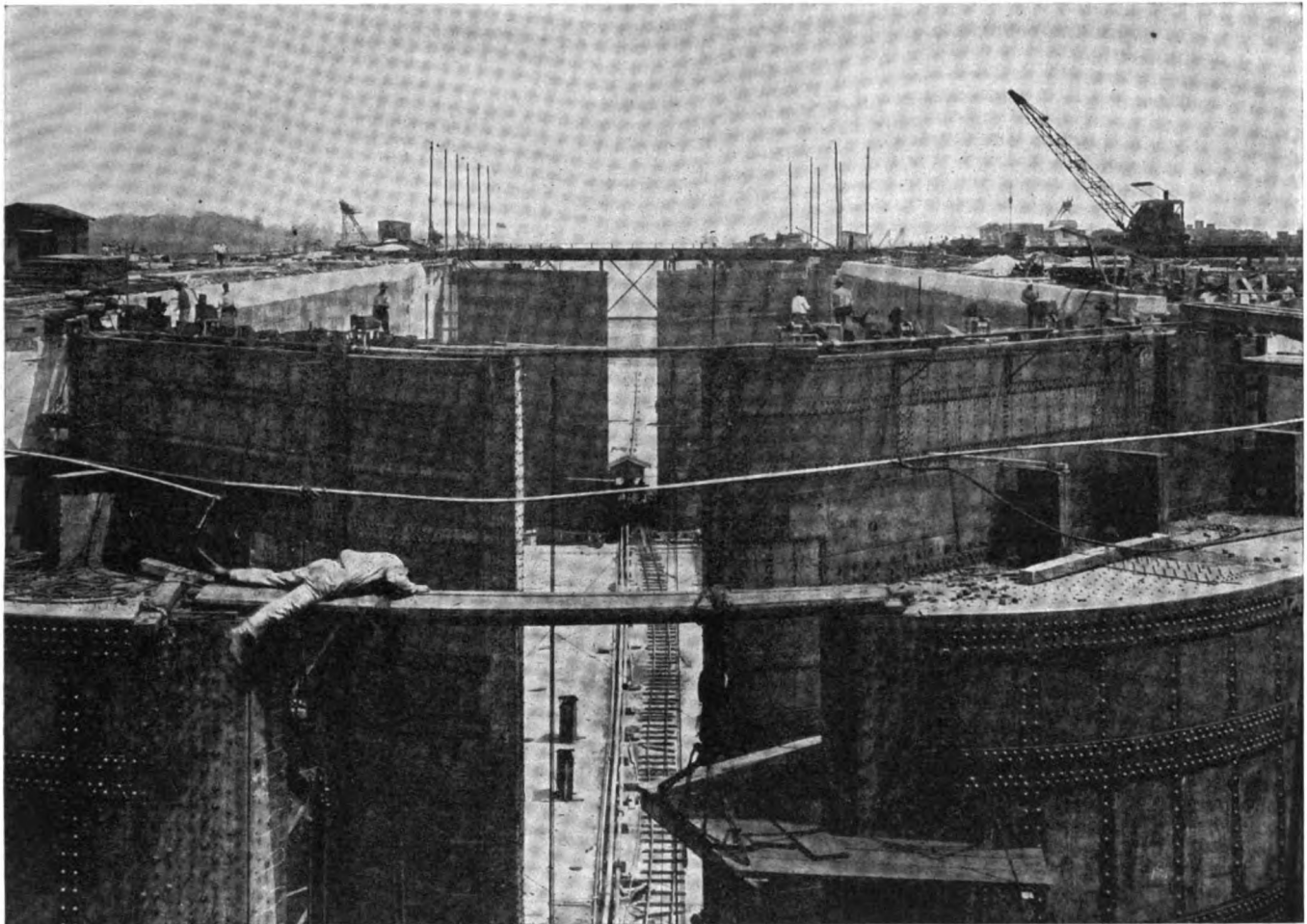
This dam is nearly $1\frac{1}{2}$ miles long, over half a mile thick at its base, and its crest is 105 feet above sea level. The lake formed by this dam covers about 164 square miles, and ships will pass across it in their canal journey for a distance of 23 miles.

Near the center of Gatun Dam is the spillway—a concrete-lined channel, 1,200 feet long and 285 feet wide, which was cut through a hill of rock. Immense steel gates regulate the flow of water over the dam.

The locks through which our ship has passed are each 1,000 feet long and 110 feet wide. The series of three locks at Gatun are three quarters of a mile long. The gates of the locks are in pairs and swing from



SLIDE OF STRATIFIED ROCK ON THE WEST BANK OF THE CANAL AT CULEBRA, INVOLVING 900,000 CUBIC YARDS



UPPER LOCKS AT GATUN—WEST CHAMBER, SHOWING CONSTRUCTION OF THREE SETS OF GATES
— THIS PICTURE GIVES ONE AN IDEA OF THE SIZE OF THESE MAMMOTH GATES

each side of the lock toward the center. They are steel structures, 7 feet thick, 65 feet long and from 47 to 82 feet high. There are 46 pairs of these gates, or 92 leaves in all for the entire canal. Their total weight is 60,000 tons.

At Gatun is also located a hydro-electric station, capable of generating through turbines 6,000 kilowatts for the operation of the canal locks, machine shops, dry dock and for lighting.

Culebra Cut

After reaching the level of Gatun Lake, our ship steams at full speed for a distance of 24 miles to Culebra Cut. Here we view one of the greatest tasks in the building of the canal. What is known as Culebra Cut is simply a big ditch cut through Culebra Hill, whose peak was 495 feet above the bottom or floor of the canal. This cutting and digging at Culebra Hill has been the main feature of Panama Canal excavating for over thirty years. In all, over 108 millions of cubic yards of earth have

been removed from Culebra Cut, and on January 1st of this year but 5 million cubic yards remained to be excavated. As the record excavation for one year is over three times this figure, it may readily be seen that the remaining amount of "dirt" will soon disappear.

The width of Culebra Cut as originally planned was to be 670 feet, but the slides and breaks which have occurred at this point have necessitated making the width across the top of the excavated part 1,800 feet. It is estimated that the amount of material removed from the canal

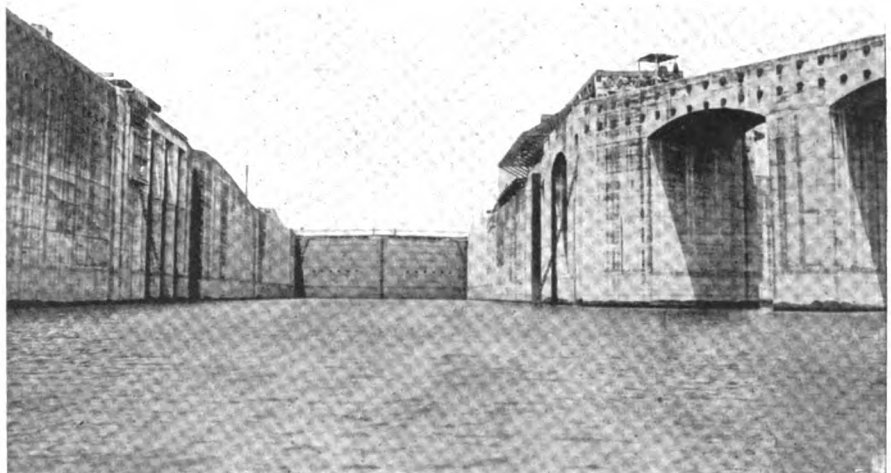


Photo by Paul Thompson

COMPLETED UPPER GATUN LOCK PARTIALLY FILLED



because of these slides alone is close to 22 million cubic yards.

Toward the Pacific

After passing through Culebra Cut we approach the lock at Pedro Miguel which drops our boat gently down a distance of 30 feet to the level of Miraflores Lake. We then steam along this lake, which is also artificial, to Miraflores, where a series of two locks lowers our ship 55 feet to the level of the sea. A short passage through a channel about 8 miles long brings us to the Pacific Ocean—the same majestic Pacific which Balboa discovered, viewed and dreamed about just four centuries ago.

An Idea of the Immense Task

To get an idea of the immensity of the task undertaken in building the Panama Canal one need but glance at some of the figures pertaining to the work and then try to think what they mean.

The amount of excavation for the canal and for all permanent structures connected with it is estimated as close to 213 millions of cubic yards.

It is estimated that 5 millions of cubic yards of cement will be used before the canal is completed.

The force of men employed on the



Photo by Paul Thompson

LOOKING ACROSS THE CUT AT CULEBRA. HERE AN IDEA OF THE DEPTH OF THE CUT MAY BE HAD

canal and upon the Panama railroad totals about 40,000.

The total cost of the canal when finished is estimated at 375 millions of dollars.

Work on the canal was begun by Americans on May 4, 1904, and while the canal will actually be open and in operation before, the date of the official opening is January 1, 1915.

The Locks

No ship will be allowed to pass

through any of the locks under its own power but will be towed through by electric locomotives operating on tracks on the lock walls.

For protecting the gates of the locks against any possibility of accident, a number of protective devices have been provided. Fender chains, each weighing 2,400 pounds, will be stretched across the lock chamber from the tops of the opposing walls in front of the gates. When it is



Copyright by Underwood & Underwood

THE LOCKS AT MIRA FLORES. THE CONCRETE WORK AT THIS POINT IS NOW VERY NEARLY COMPLETED



desired to allow a ship to pass, the chain will be lowered into a groove made for the purpose in the lock floor. Should a ship accidentally run into this fender before the gates are open, the chain will be paid out gradually by an automatic release until the vessel is brought to a stop. Beside the chains there are also fender gates which will act as protectors for the main gates should the vessel by chance break away from the towing locomotives or break through the chainguards.

For filling and emptying the locks, culverts, large enough to permit the passage of a locomotive, run through the lock walls. The flow of water through these culverts is regulated by a system of gate valves, any of which can be opened or closed in one minute.

The infinite care with which every part and section of the canal has been planned and is safeguarded may be realized when one considers the system for operating the gates of the locks, the fender chains and the water flow gates. At Gatun, for example, in passing a large ship through the locks it will be necessary to lower four fender chains, to operate six pairs of gates, to open and close eight pairs of valves in the main culverts and thirty valves in the smaller culverts; and each and every operation will be controlled by one man at a switchboard which, by means of ingenious interlocking devices, will prevent certain switches being thrown before the correct preceding switch has been thrown. A fender chain, for example, cannot be lowered before the gates which it guards are opened; and, similarly, gates cannot be closed before the chain guarding them is raised into place.

Masterpieces of Engineering

There are many features of the canal which may rightly be called masterpieces of engineering skill; in fact, there are few things of importance that have not been planned especially to meet extraordinary conditions and are distinctly original in their application.

There are emergency dams, for example, by means of which a temporary dam can be built within the canal walls in case of a bad accident to the gates, or in case it is necessary to make repairs to either locks or gates.

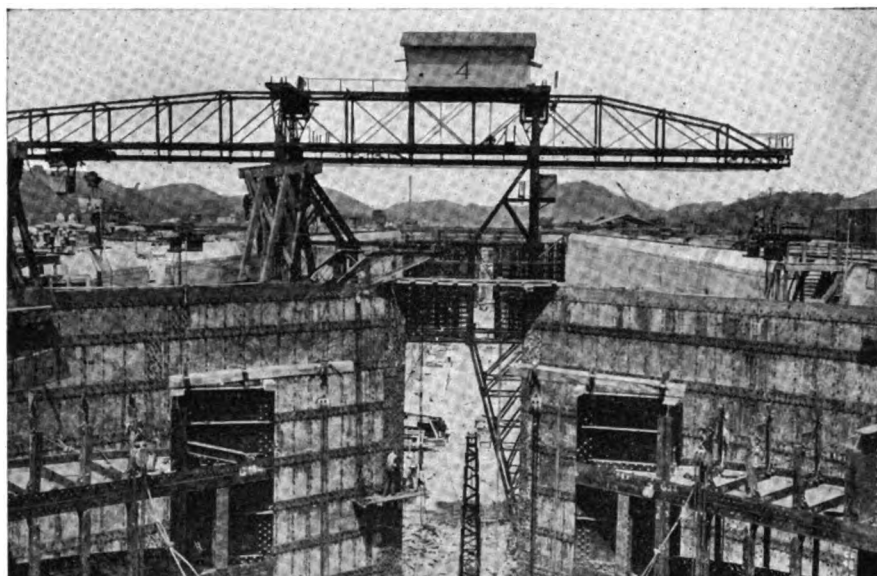


Photo by Paul Thompson

A VIEW THROUGH THE LOCKS AT MIRAFLORES

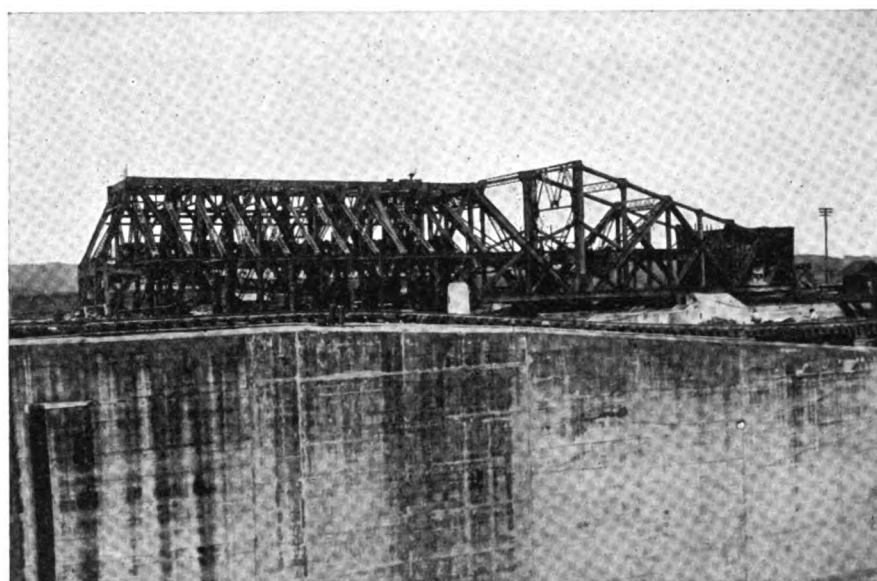


Photo by Paul Thompson

HERE IS SHOWN ONE OF THE EMERGENCY DAMS

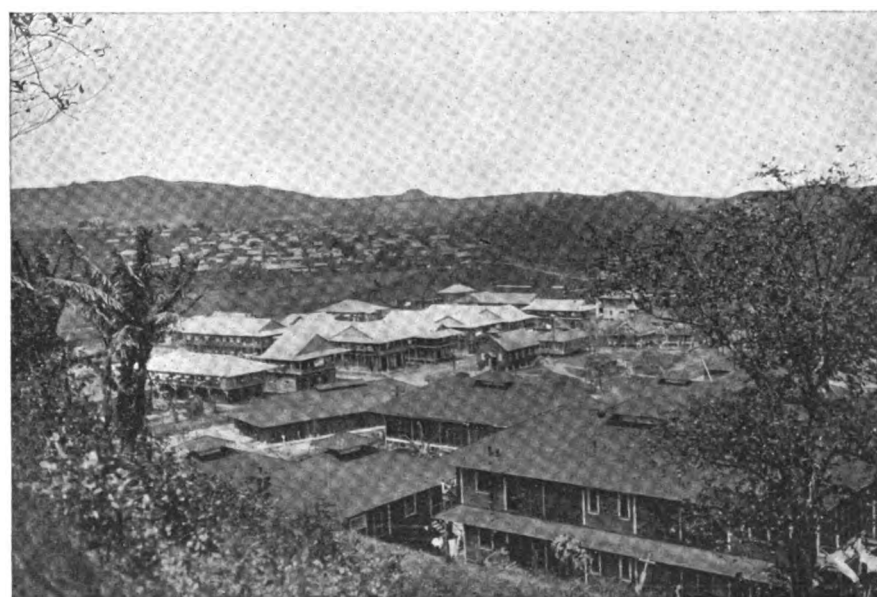
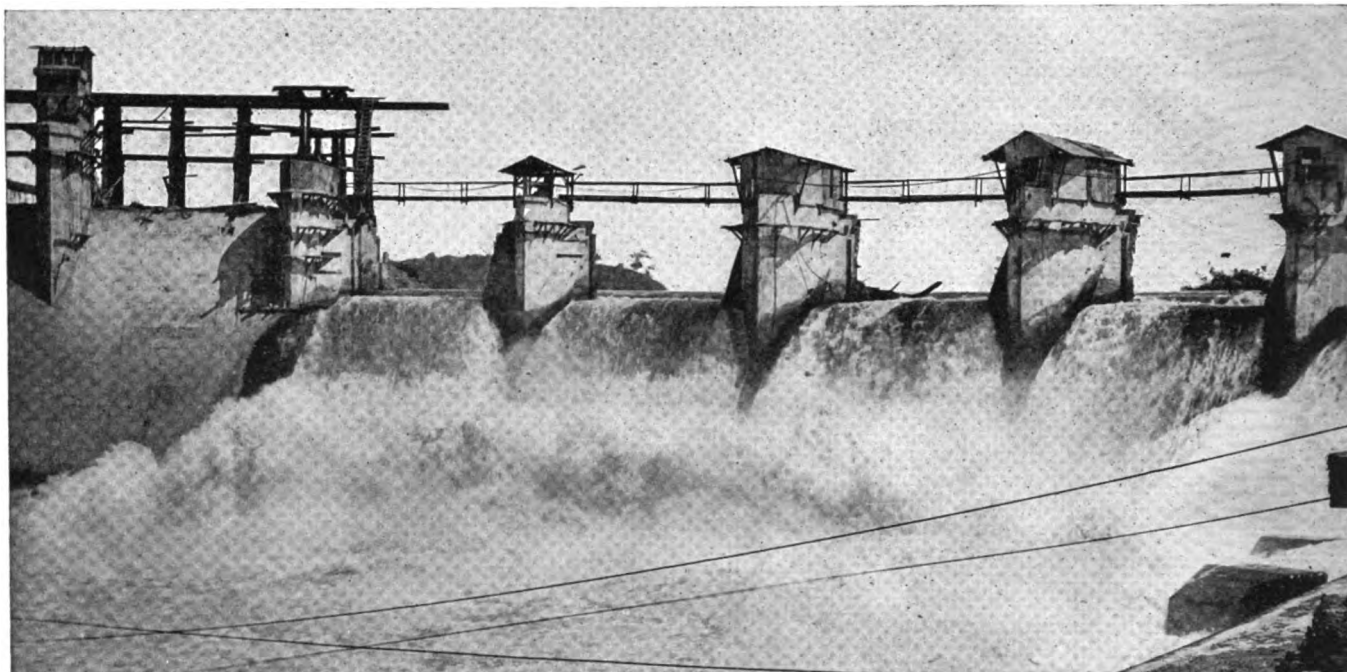


Photo by Paul Thompson

A VIEW OF THE VILLAGE AT CULEBRA, FROM THE HILL

*Photo by Underwood & Underwood*

THE GATUN DAM. FIFTEEN THOUSAND CUBIC FEET OF WATER IS DISCHARGED EVERY SECOND OVER THE CREST

Then there are caisson gates, of the floating, molded ship type, which will permit the examining, cleaning, painting and repairing of the lower guard gates of the locks and the gates of the spillway dam. These caissons will be equipped with electric motor driven pumps for use in pumping out the caissons and for unwatering the locks.

An example of the great economy

with which work has been done at Panama will probably best be understood by giving a few facts and figures in connection with the blacksmith work:

In the smith shop, after the installation of oil as fuel, nine oil furnaces were installed, five of which were manufactured right in the shops. This equipment gave the shops just twice the heating capacity of their

former equipment. Then special attention was devoted to equipping the shops with dies and formers for use in machine forging, and in the making of repair parts in large quantities. It was demonstrated after the dies and formers were installed that one operator with a machine could produce as much work as would formerly require the services of ten smiths at hand forging. In the forg-

*Photo by Paul Thompson*

ANOTHER VIEW OF THE CULEBRA CUT. IN THIS PICTURE THE CUT APPEARS AS A CANYON WITH MOUNTAINOUS SIDES.



ing of grab irons, for example, the smithing labor was reduced from eleven cents to two cents.

The effect of the equipment is summarized in the following report: "The highest output of forgings in the previous year for one month with a pay roll of \$5,632 was 176,861 pounds. This year the greatest output for one month was 329,589 pounds with a pay roll of \$3,828."

This shows an increase of 152,728 pounds, or 86.4 per cent, with a pay roll reduction of \$1,804, or 32 per cent. If we assume that the pay rolls were equal for the two years, even then this would show an increased capacity of the shop on the work handled of 174 per cent.

The foregoing report on the saving established in the smith shop will give you an idea of how this entire project has been carried forward. The costs of dredging and excavating are simply wonderfully low, as a comparison between actual costs as shown by the books of the Canal Commission and the bids which have been received from privately owned companies show.

The First Ship

When the first ship passes through the canal at Panama a new era in International Trade will be inaugurated. And while the official date of opening the canal has been set for January 1, 1915, it is the intention to allow vessels to use the canal as soon as practicable. Present developments and conditions of the work at Panama indicate that the first ship will pass through the canal some time during the latter part of this year.

Balboa first saw the Pacific Ocean on September 25, 1513. Will the first ship pass through the canal at Panama on the 400th anniversary of the discovery of the Pacific? Will the Dream of the Centuries "come true" exactly four hundred years from the day of its birth?

"Weighing" Employees

A. M. BURROUGHS

The head of a big Chicago plant, looking over the reports for the month, noticed that one department showed a slight falling off from the preceding month and from the corresponding month of the preceding year.

On examining the reports of each

employee in the department, he found that three of them had made less than during the preceding month, or during the corresponding month of the preceding year.

A further study of the figures proved that these three men had shown a steady falling off, while the other two men in the same department had gradually increased their output.

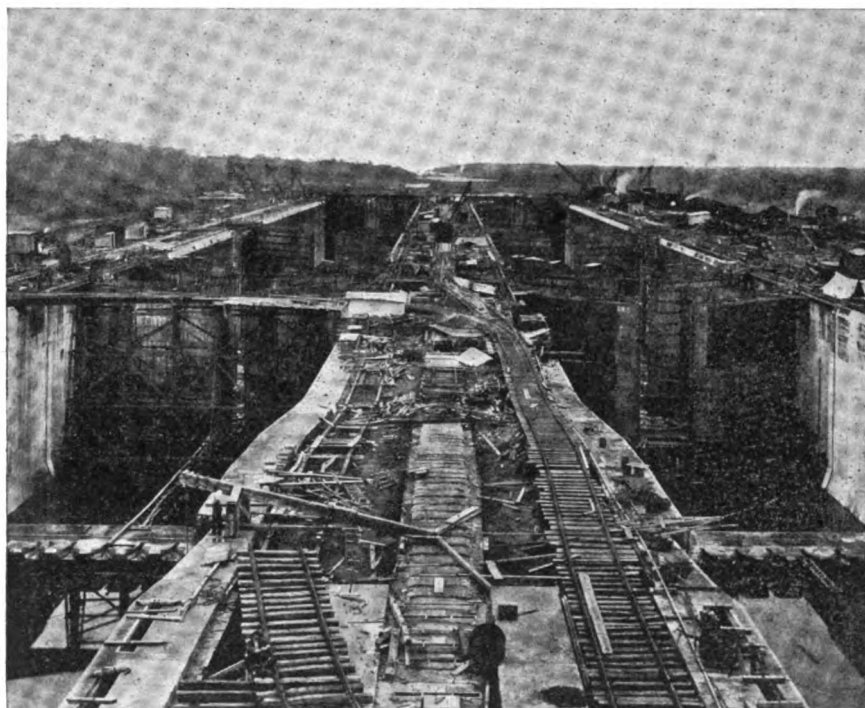
The two men were costing about 8 per cent on their production as against $9\frac{1}{2}$ per cent for the same men for the preceding year, a nice increase in efficiency.

The other three who showed a falling off, were costing around 11 to 12 per cent.

There is no *guess-work* about the value of employees in the scientifically managed plants. Employees are judged wholly by what they do, and the figures which are furnished to the head of the plant are figures which enable him to absolutely *know*, without a question of doubt, what every man is doing and what he is worth.

Every employee is a barometer, whose readings, in dollars of production and per cent of cost, are always on file in the manager's office.

If the salary runs to a certain low per cent the employee is scheduled for a raise. If it runs down to a



THE UPPER LOCKS AT GATUN, GIVING AN EXCELLENT VIEW OF THE GENERAL LOCK PLAN

This brought the salary cost for the department up to $10\frac{1}{2}$ to 11 per cent.

It wasn't necessary for the manager to call in the foreman. No conferences were necessary. The figures told the whole story. Two of the five men were good men and three of the five were unprofitable,—inefficient.

In a month the department had picked up until the salary cost was down to the regular $9\frac{1}{2}$ per cent;—five good men were handling the work.

In big plants, men are judged and paid on a basis of good work they do.

still lower per cent the employee will soon be promoted.

Have you ever puzzled over the problem of whether to raise the salary of a certain employee who is looking for a better job?

Have you ever wondered whether the old employee who seems satisfied to stay on with you year after year without much increase in salary is really worth what he is getting?

If you have more than one man, are you absolutely sure which is the *best* one?

Wouldn't it put some warmth in your words when you tell John that you are going to give him that extra dollar a week he asked for, if you



could turn to your records and see that John had been showing a steady increase in work day by day and week by week for many months past?

And wouldn't it put backbone into your decision *not* to give Henry a raise when you could see by your records that his work was showing a steady falling off? Maybe you could even find another "John" to take his place.

Let John and Henry make out a job ticket for each job. Have the figures on these slips tabulated by days, then recapitulated into months. Then you can *know*, all the time which is the *best* man.

It wouldn't take much time. The big business places find that it pays *big dividends* in "weighing" employees.

It costs them as much per man as it would you. Some of them have as high as 5,000 men all making out slips on every job.

The average big plant can find out more about the ability of any one of its 5,000 men in five minutes than the average small shop could tell about its one helper in a whole month.

The success of big plants proves that it *pays* to keep records. Are you going to let the big fellows crowd you out of business, or are you going to defend yourself with the weapons they have sharpened for you?

(A chapter from "A Better Day's Profits." Copyright by Burroughs Adding Machine Co.)

EDITOR'S NOTE—The next paper by Mr. Burroughs is, "Accounting Good at the Bank." Someone has said "The sort of man the banks say 'No' to is the man who doesn't know all the facts about his business." This paper brings out another reason for proper accounting methods.

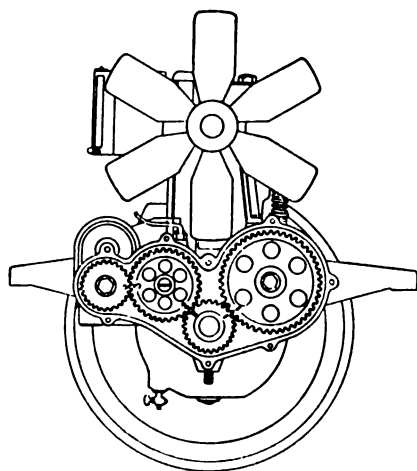


FIG. 1—SHOWING GEARS MARKED FOR PROPER TIMING



The Care, Repair and Operation of the Automobile—7*

(With Special Reference to Overland Cars)

Re-Meshing Time Gears

Covered by a case, in front of the motor and behind the lower pulley of the cooling fan, there are four spiral gears—the crank shaft gear, the cam

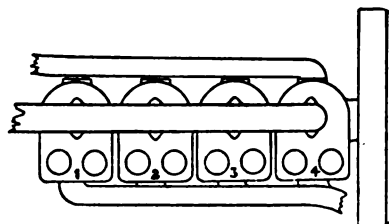


FIG. 2—THE CYLINDERS DO NOT FIRE IN THE ORDER AS NUMBERED

shaft gear, an idler and the magneto gear. When these gears have been taken out, and are to be reassembled, this is the way to do it:

Turn the flywheel until pistons one and four are on upper dead center, with number one ready to fire. On keying the cam shaft gear and the crank shaft gear to their shafts, the figure 1 on the former will mesh with figure 1 on the latter, as shown in the engraving, Fig. 1. Now replace the idler gear so that the figure 2 on crank shaft gear and figure 2 on the idler also come in mesh. Finally, mesh the figure 3 on the magneto gear with figure 3 on the idler gear, and the proper meshing of the gears will have been accomplished.

*(Copyright by Willys-Overland Co.)

Timing the Valves

This, too, is an operation which should be taken with caution and carried out with accuracy and by a person competent to do such work.

The rim of the flywheel bears at various points the following marks:

1-4 UP means cylinders 1 and 4 are in their uppermost position

2-3 UP means cylinders 2 and 3 are in their uppermost position

1-4 1-O means inlet valve of cylinder 1 or 4 opens

1-4 1-C means inlet valve of cylinder 1 or 4 closes

1-4 E-O means exhaust valve of cylinder 1 or 4 opens

1-4 E-C means exhaust valve of cylinder 1 or 4 closes

2-3 1-O means inlet valve of cylinder 2 or 3 opens

2-3 1-C means inlet valve of cylinder 2 or 3 closes

2-3 E-O means exhaust valve of cylinder 2 or 3 opens

2-3 E-C means exhaust valve of cylinder 2 or 3 closes

The motor cylinders are numbered between the valve caps Nos. 1, 2, 3, 4; number 1 being the cylinder near the radiator and number 4 the nearest to the dash.

Cylinder number 1 fires first, number 3 next, then number 4, and finally number 2.

The timing of the valves is perhaps best understood by reference to the diagram in Fig. 3. It will be seen that the intake valve opens when the flywheel is 8 degrees past upper dead center and closes when it is 38 degrees past the lower dead center. The exhaust valve opens 46 degrees before the lower dead center. The exhaust valve opens 46 degrees before the lower dead center and closes again 15 degrees past upper dead center; thus the inlet valve opens and closes late,

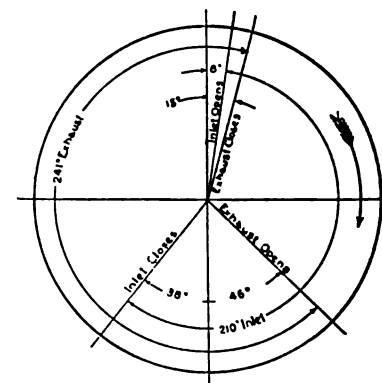


FIG. 3—VALVE-TIMING DIAGRAM



whereas the exhaust valve opens early and closes late.

The flywheel of Model 69 being 17 inches in diameter, and that of Model 71, 18 inches, the following table gives the measurements, in inches, of the valve operation when laid out on the rim of the flywheel:

	Mod.69	Mod.71
Diameter of flywheel . . .	17 in.	18 in.
Inlet valve opens late . .	$1\frac{3}{8}$	$1\frac{1}{4}$
Inlet valve closes late . .	$5\frac{3}{4}$	$5\frac{3}{4}$
Exhaust valve opens early	$6\frac{3}{4}$	$7\frac{1}{8}$
Exhaust valve closes late	$2\frac{1}{4}$	$2\frac{3}{4}$

To determine whether the setting

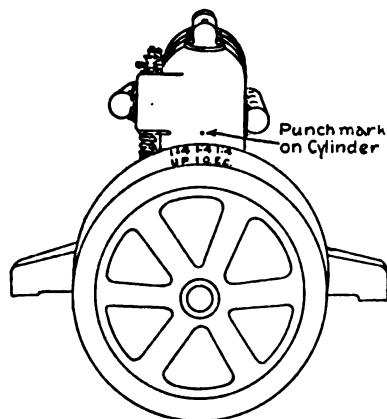


FIG. 4—SHOWING MARKS ON CYLINDER AND ON FLYWHEEL

of the valves is correct, proceed as follows, beginning with cylinder number one:

Open the priming cocks over all exhaust valves, to make the turning of the flywheel easier.

Turn the flywheel to the left until the mark 1-4 UP is in line with the punched guide mark on number 4 cylinder, as shown in Fig. 4. Now pistons 1 and 4 are at their highest points in their cylinders, or on upper dead center. About one and a quarter inch to the right of the mark 1-4 UP you will notice the mark 1-4 1-O. Turn the flywheel to the left until this mark is lined up with the guide mark on the motor. At this point the inlet valve of either cylinder 1 or cylinder 4 should begin to lift. If the lift should occur in cylinder 4, turn the flywheel one complete revolution until the mark 1-4 1-O again appears on top and in line with the guide mark. Now watch or feel the inlet valve stem; it should just begin to lift from its seat.

To determine the closing point of the same inlet valve, turn the flywheel a little more than half a revolu-

tion until the mark 1-4 1-C appears on top. With the flywheel in this position the inlet valve should be closed and there should be just enough space between the top of the valve-lifter and the toe of the valve stem that a thin visiting card can be placed between them. At the factory, stem and lifter are set so that the distance between them is exactly twelve thousandths of an inch; this clearance is necessary to compensate for the expansion of the valve stem when it becomes hot during the operation of the engine.

If adjustment is necessary, loosen the lock nut on top of the valve plunger and screw the adjusting nut up or down as required. If the play between the plunger and valve stem is too great, the result will be noisy operation; if the adjustment is too close, the valve may be prevented from seating fully.

Next, test the exhaust valve, again bringing 1-4 UP to the top and turning the flywheel to the left until the mark 1-4 E-C appears in line with the guide. After you have tested the closing of the exhaust valve of cylinder number 1, test its opening by revolving the flywheel until the mark 1-4 E-O comes to the top.

Then go carefully over the valves of cylinder number 4 and of numbers 2 and 3.

A slight variation of the flywheel markings to the right or left of the guide mark is permissible, but it should not be greater than a quarter on an inch.

(To be continued)

An Electrically Operated Gear Shift

The accompanying engraving shows a sectional elevation of the electric gear shift device as pictured in "The Automobile Journal."

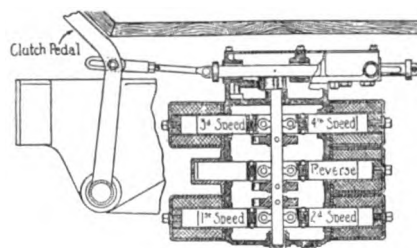
The system is not complicated, being controlled by solenoid coils (magnetic coils), one for each forward speed and reverse. Two switches are utilized between the battery and solenoids, a knife switch controlled by the clutch pedal and the push buttons, located on the steering wheel. The knife switch controls all the changes, and the push buttons only arrange the circuit for the particular speed desired.

As will be noted by the engraving the clutch pedal moves through a

link during the first part of its motion and during the balance picks up the link and carries it along with it. Thus the first movement is the conventional operation of the clutch, but the completion of the throw actuates the knife switch, current flows from the battery through the solenoid coil and pulls a plunger against a magnet with a force of 150 pounds. The energy is transmitted through an arm to the gear shifting fork and gear, securing the desired speed change.

The plungers are shown in a neutral position in the sketch, and when the button is pressed on the control member a 12-volt current passes through the coils around the plungers, drawing them against the magnets. The current required to make the shift is held to be about 17 amperes, and it is stated that about 300 changes of speed may be made with less current than is required to start the motor.

The gears cannot be stripped, because the clutch must be disengaged before a shift is made, and the gears are always in neutral before the magnets accomplish the change. This is purely a mechanical action through means of the clutch movement. No two speeds can be utilized at the same time, because each speed is governed independently of any other,



SECTIONAL VIEW OF THE ELECTRICALLY OPERATED GEAR SHIFT

and an interlocking device prevents the use of any two buttons at once by mistake.

The box containing the switches and solenoid coils is mounted at the side of the gear box and it is stated that it adds but 46 pounds to the weight of the chassis.

On the S. G. V. car the control buttons were mounted in a neat aluminum box on the steering wheel, one for each speed and including a neutral member. The operation of the system is very simple. If the fourth speed button is pushed down, the clutch thrown out and then re-engaged, the machine will be in fourth speed. If in traveling in traffic on



the third, the driver can set the second speed button and, by depressing the pedal fully, shift into second. Similarly, changes may be made up. This is an advantage in that the operator does not have to lift his hands from the wheel. The system is quiet, the only perceptible noise being a slight click as the gears engage in the changing of different ratios.

The Importance of Iron

Mr. I. J. Stites of New Jersey sends in the following clipping. It is interesting as showing the importance of iron, and if value is to be rated on the basis of usefulness, then iron is surely the most valuable of the metals.

"Iron vessels cross the ocean;
Iron engines give them motion.
Iron pipes our gas deliver;
Iron bridges span our rivers;
Iron stoves for cooking victuals;
Iron ovens, pots, and kettles;
Iron horses draw our loads;
Iron rails compose our roads;
Iron anchors hold in sands;
Iron rods, and bolts, and bands;
Iron houses, iron walls;
Iron cannon, iron balls;
Iron axes, knives, and chains;
Iron augers, saws, and planes;
Iron globules in our blood;
Iron particles in food;
Iron lightning rods on spires;
Iron telegraphic wires;
Iron hammers, nails, and screws;—
Iron in everything we use."

Is It the Business or the Smith

A. PHEIFER

I want to say that every blacksmith should read Mr. Pokorny's letter, "What Ails Business?" It is the best I ever read. Now I am not a knocker, by any means, but I will admit that business is dead and work is flushing. I know of a smith who is a first-class mechanic and who has made most all of his own tools, even to his screw plates, and has worked hard and steadily all his life, but today he is working in a rented shop, and he will sell his business for \$600. When he completes a piece of work he has no more idea of what to charge than a two-year-old child.

If some of the smiths who own their own shops would count their rent and expenses, as Mr. Pokorny advises, many of them would be working for someone else by the week. Here is a little incident that happened to me recently: While making out a

contractor's bill I began to explain the prices to him, telling him I charge 40 cents an hour and for some of his work 50 cents an hour; and he said if I charged him those prices he knew I did not overcharge him. He said he had men working for him whom he paid 60 cents an hour, and that a blacksmith is the cheapest mechanic he can hire. "He will work three years to learn the trade, and carry from two to three thousand dollars' worth of tools and stock, and work for forty cents per hour—and some will work for less—and after working for years they realize that they got the work, but did not get the price."

I am glad THE AMERICAN BLACKSMITH is teaching the smith more about business.



The Man Who Liked His Work

"Say, Mr. Editor, I want your help," exclaimed Benton as he burst into the "forge room" waving a sheet of paper. "I just got a letter from an old chum of mine and I think you can help me out."

"What's it all about?" asked the Editor. "Read the letter and then we'll get right down to business."

"Well, the chap tells a long, hard luck story and wants to know why he hasn't been able to gather in a few bales of this world's goods. He says 'I don't drink, smoke or gamble, yet after working for thirty years I can put all I've got into an egg cup and still leave room for a few unpaid bills. Now, how would you write that chap?'" asked Benton as he finished.

"Benton" began the Editor "I was down the State a while ago to call on an old friend of mine who runs a big—"

"That's all right,—but what's that got to do with this letter?" interrupted Benton, with some heat.

"If you'll keep your coat on, I'll come to that very shortly," returned the Editor calmly. And then continuing—"As I said, I called upon a friend who has built up a big manufacturing business. This friend is himself president of the company and is himself responsible for the big success he has made.

"Well, when I got down his way I stopped in to call on him, and the story he told me

is, I think, just the one to tell that chum of yours.

"It came about this way: Jim and I were sitting in his very comfortable but modest office, enjoying a good smoke and an old-time chat, when a solid looking fellow came in with some papers. This fellow was about thirty-five or thirty-eight and came into the room as though he meant business. He said something to Jim, handed him the papers and then quickly withdrew. And when the door closed again I asked Jim who he was.

"Here's the story just as Jim told it.

"That's John Marcus, manager of my plant, and the best manager there ever was. John came here several years ago when the plant was small and started in as 'shop kid', with nothing in particular to do except those things that no one else wanted to do. And he found more things that should be done, and that he could do, than any boy before him or since.

"But I didn't think much about him until one day I happened to come across him in the shop sweating like a cake of ice in July and pulling and tugging at some crates which had contained some new machines. I watched him for a minute or so and finally asked him what he was trying to do.

"I'm getting these old crates out of the way, sir, and I'm hustling because I'm due to help Keeler on his machine in a couple of minutes. I thought I'd do this while Keeler was changing the machine for the triple-X stuff."

"And back he went again at those crates until he had them all piled up in a corner of the yard out of the way. And as he came in on his way back to his own job I asked him how he liked his work.

"Well, sir, I like it fine", and with a face fairly beaming with enthusiasm he ran to answer Keeler's call.

"The next time I saw him he was at a machine—not helping, but running it himself, and again when I asked him how he liked the new job he replied:

"It's just great to run a machine yourself and to see it do the things you want it to."

"Then one day as I was going through the plant, which had just been enlarged, John Marcus came up to me and asked if he might make a suggestion. Of course I consented, and he didn't let up until he had shown me where some big mistakes were made in the placing of the machines, and when I asked him why he didn't speak of it before, he said he'd just been put in that department.

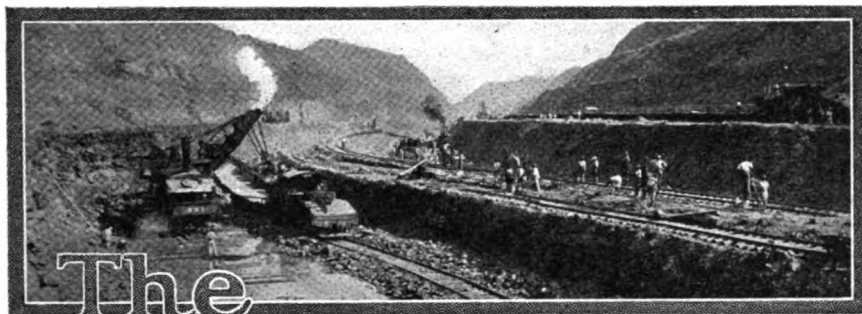
"We'll increase our output just 25% if we make those changes, sir and I hope you'll give me permission to work the force all day Saturday to make the re-arrangement. The boys are ready to do the work if you'll say the word."

"Of course I gave my permission. And when the change was made the cost sheets for that department showed an increased output of 33%. When I called John in to speak to him about it he told me he expected to make a still further increase. And when I asked him how he liked the job of department manager he said: 'Fine. I like it better than anything I've done so far.'

"And later his department showed that still greater increase, and so when the former manager retired, Jack Marcus was put in his place. And his next move up will be as a partner."

"Now," finished the Editor, "do you know the secret of that fellow's rise? He was enthusiastic about his work—he worked his brain as well as his hands in that same enthusiastic way and—that's all."

And the Editor brought the tale to an abrupt close by turning to the matter on his desk.



The Canal Builders

They paid forty millions of good solid coin
For the privilege of trying two oceans to
join.
Then ten millions more were exchanged for
a spot
That had pretty near gone to blazes and
pot.
Then millions more followed—three hun-
dred or so—
'Till it seemed as tho' gold 'stead of
water would flow
Through the gates of that ditch that they
dug in the sand
Where they joined the two oceans and
divided the land.

When they saw what they got for the mil-
lions they paid
And found heaps of bones where the sick
had been laid
They knew that the place needed cleaning,
and that
The blood-sucking "skeeter" was due a
good rap.
So they scrubbed and cleaned and squirted
white paint
'Till they made the hole clean as the feet
of a saint.
They took out the poison and filtered the
smell—
Made a garden-like Eden of a veritable
hell.

When the place was made clean, they found
fault with the map,
And tore it to shreds without caring a rap.
They sorted the pieces, rearranged them
with mirth,
And changed several features at that
point on the earth.
They cut down a mountain that grew up too
high,
Put in a few lakes where they found the
land dry.
They piled some cement as high as a hill,
Just to make a dead river to do as they
will.

They picked up a railroad that lay in the
way
While they kept the trains moving just
the same, night and day.
They then put it down where 'twould do
the most good
And made it behave like a good railroad
should.
They cut a big ditch some fifty miles long,
And did it as though they were singing a
song.
Through rock, sand and mud, lake and
river, they dug
Just to make passage way for some
bloomin' old tug. —W. O. B.

days at least. Then you'll appreciate home
so much more. And don't forget the
missus and kiddies.

Cuff Brasher says: "Ain't it funny?—
Sum folks hes t' be everlastingly booted
about, a'fore they'll do things thet air fer
their own good. Arr' nothin' this side o'
hell'll keep them same folks from pokin'
into other people's business."

Are you putting some money in your
pocket? Registration figures from the au-
tomobile bureaus of the various States indicate
that there is one automobile for every one
hundred persons in the United States.
Again we ask, are you putting some auto-
mobile repair money into your own pocket?

Wooden blacksmith hammers sounds
strange to our ears, yet the Japanese black-
smiths are said to use wooden hammers in
their work. Their saws are also peculiar
in that they cut on the upward stroke in-
stead of downward. And the plane of the
Jap carpenter is operated toward his body
instead of being pushed.

Some idea of the power and cost of Uncle
Sam's navy may be had from the following
figures: The "Minnesota", one of Uncle
Sam's big battleships, carries two 12-inch
guns, each of which is 44½ feet in length,
has an effective range of 11 miles and can be
fired at the rate of two shots a minute.
Each gun cost \$60,000.00 and has an esti-
mated life of 200 shots. A single powder
charge for either gun weighs 310 pounds
and costs \$190.00. The projectile is 42
inches long, weighs 870 pounds and costs
\$280.00, making a total cost of \$470.00 for
one shot. The projectile leaves the gun at
a speed of more than 30 miles a minute.

Asked for his secret of thrift, a well to do
Western man who never received a salary
of more than \$115.00 a month, but who
saved twenty thousand by judicious real
estate investment, said: "First, marry right.
The wrong woman can spend more money
than any man can earn if she wants to.
Then watch the nickels—don't waste them—
and the dollars will care for themselves.
Don't smoke and, above all, don't drink.
Have warm clothes and plenty to eat."

The next time you have a particle of steel
or emery in your eye have someone remove
it by trying this method: Pull a horse hair
from the inner lining of your coat or from
the tail or mane of a horse if one happens to
be in the shop. Wipe the hair clean with
your handkerchief and form a loop by fold-
ing it double. Now turn back the eyelid of
the affected eye and remove the speck by
drawing the loop of hair over the eye.

A German firm is said to be successfully
using quite a unique method of hardening
steel by compressed air. The air is sprayed
over the metal to be hardened through a
series of special nozzles which vary in
number and spacing according to the results
to be obtained. In this way the treated
portion of the metal may be graduated
toward natural softness from the specially
hardened spot, thus overcoming one of the
steel workers' big stumbling blocks—the
abrupt line dividing the hard from the soft
parts, thus creating strains and often
cracks.

In a normal hoof, the frog comes down to
the ground, at the back, directly under the
greatest pressure, and possessing an elas-
ticity similar to Indian rubber acts as a cush-
ion in breaking the concussion that would
otherwise take place. Cut it away, so that
it does not come in contact with the ground,
and the support is gone. Moreover, the frog
shrinks, hardens and is incapable of per-
forming its function. The result, with a thin,
dried-up sole, the shrunken hoof draws the
quarter with it and you have another case
of contracted feet.



A tired horse cannot do a profitable day's
work. The horseshoer can do much to re-
lieve the tired animal.

Of course a smith has to do a bit of per-
sonal recuperating before he can expect his
shop and business to take on a better air.

The next time you put a rope to work at
hard labor try waxing it and see how much

longer it will last. Work the wax well into
the fibres.

Styles in luck will not change this season.
Your particular style of luck will, as ever,
depend upon how you plan and systematize
your work and then how you work your
plan and system.

We're getting some pretty clever letters
in that Clever Letter Contest. Have you
submitted yours? Better get your funny
bone to co-operating with your bump of
originality.

If you are one of the chaps that's just
heaping full of jokes and laughter in the
shop or at the lodge, and a regular grouch at
home, get out of the habit. Spread a few
jokes and smiles at home, too.

It is estimated that 2400 men will be re-
quired for the operation and maintenance
of the Panama Canal and the various de-
partments of the Canal Zone after the
canal is finished.

Recent tests by the American Chemical
Society indicate that the addition of a slight
amount of copper (0.2 per cent.) in steel
materially increases the life of steel sheets
subjected to atmospheric corrosion.

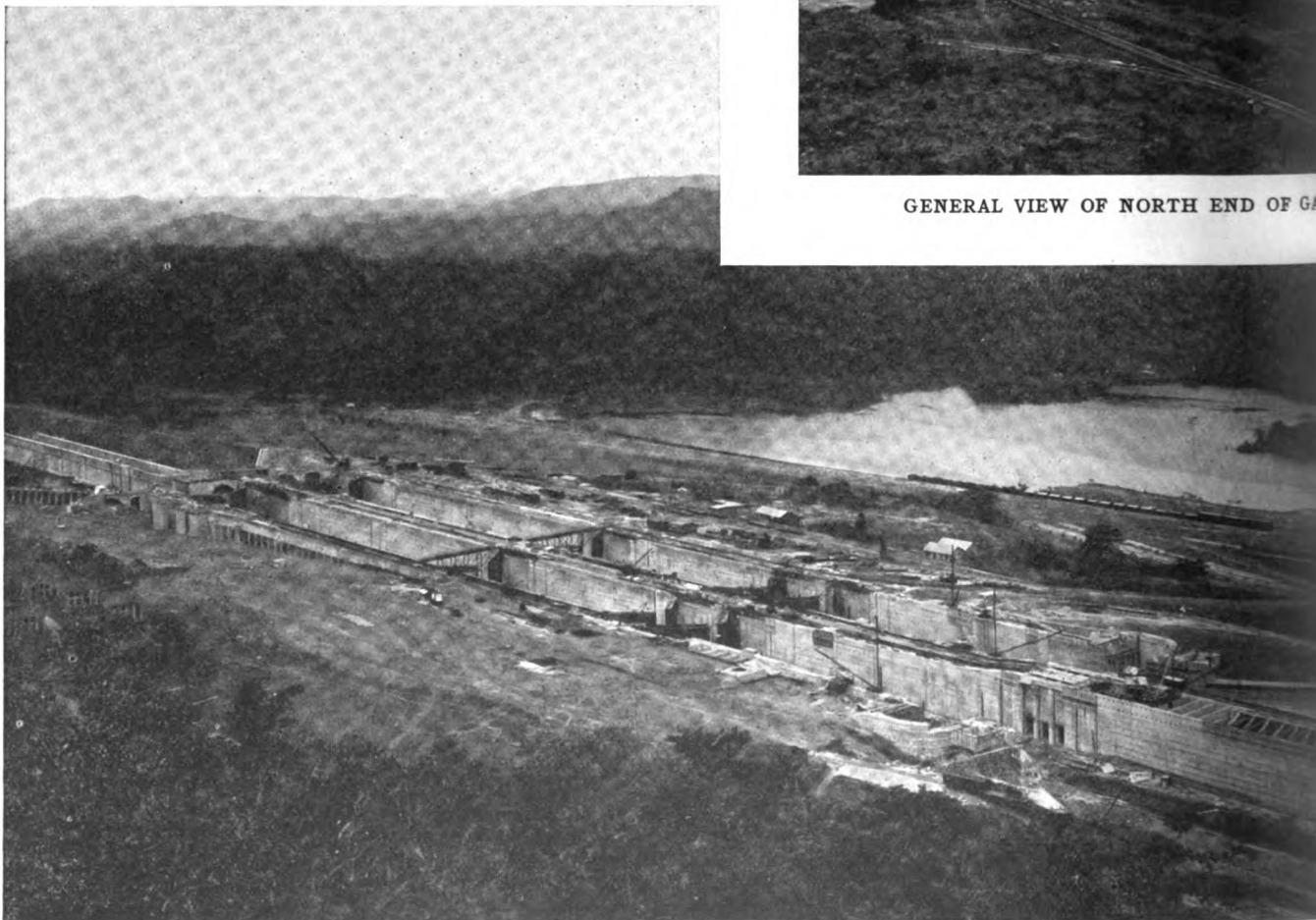
If you haven't yet taken that vacation,
do so now. Yes, we believe in "Home,
Sweet Home", but do get away for a few



GATUN SPILLWAY—DOWN STREAM FACE OF DAM



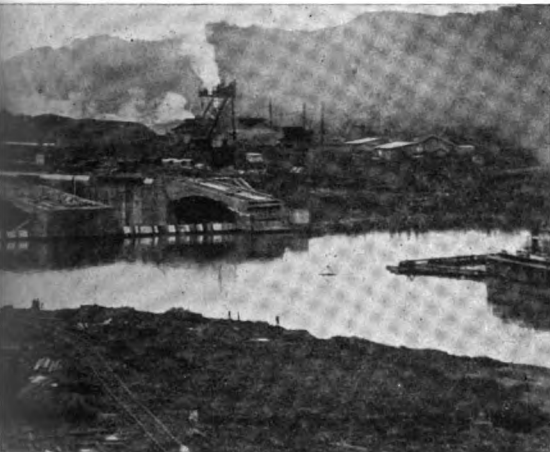
GENERAL VIEW OF NORTH END OF GATUN DAM



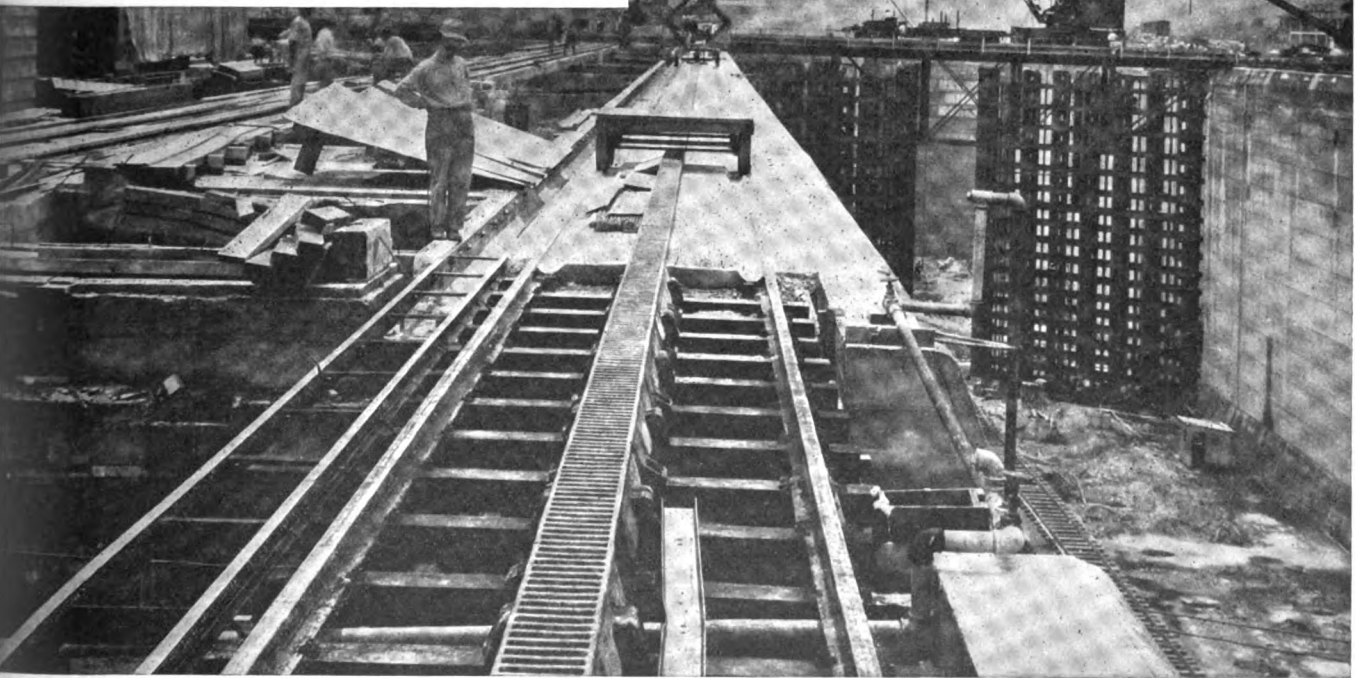
A GENERAL VIEW OF THE LOCKS AT PEDRO MIGUEL. THE WATER AT THE RIGHT IS MIRAFLORES LAKE



RELOCATION OF THE PANAMA R. R. TRACKS



SHOWING TEMPORARY COFFERDAM IN PLACE



ALONG THE DIVIDING WALL AT PEDRO MIGUEL LOCKS, SHOWING DETAIL OF ELECTRIC LOCOMOTIVE TRACK

Our Honor Roll

Fifty-Eight New Names

Fifty-eight new names have been added to Our Honor Roll this month—and eight of those fifty-eight are in the 1923 class. Are you one of the fifty-eight or one of the eight? Are you on the Honor Roll?

Just consider the saving you can make. Consider the time, trouble and annoyance you save yourself. Then get busy. Here is our plain, easily-understood, long-time rate schedule. There are no ifs or and's. Just pick out the saving you want to make, and then save it.

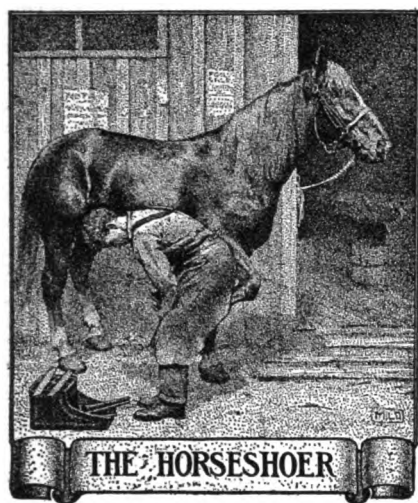
U. S. and Mexico	Canada	Other Countries
2 yrs. \$1.60 save \$.40	2.70 save \$.50	10 sh. save 2 sh.
3 yrs. 2.00 save 1.00	2.70 save 1.05	14 sh. save 4 sh.
4 yrs. 2.50 save 1.50	3.20 save 1.80	18 sh. save 6 sh.
5 yrs. 3.00 save 2.00	3.75 save 2.50	1 1/2 save 10 sh.
10 yrs. 5.00 save 5.00	7.00 save 5.50	1 1/2 14 sh. save 1 1/2 6 sh.

You can make that saving almost any amount, so why not do it—NOW?

If your account expires this month—August—order a ten-year renewal and get into the 1923 class. Look over the Honor Roll—the 1923 class is growing larger every month. Better send in your long-time order today. If you do not understand everything about Our Long-Time Rates, ask questions. Figure out the saving you want to make, and then—Save It, by subscribing for a long period.

NAME	Subscription Paid to	NAME	Subscription Paid to
W. C. WATT, Kan.	Dec., 1930	R. J. TOMPKINS, Tex.	Sept., 1918
I. J. STITZER, N. J.	Jan., 1928	A. DISCHER, Aus.	Aug., 1918
J. BAILEY, Man.	Dec., 1923	C. R. OLIVER, S. Africa	July, 1918
W. R. TURNER, Man.	Oct., 1923	L. G. REID, S. Africa	July, 1918
W. W. GREGG, Tex.	July, 1923	WRIGHT & SON, Tex.	June, 1918
OTTO SIPPPL, Penn.	June, 1923	ALBERT MELLUM, N. D.	June, 1918
A. CHAPMAN, N. Y.	June, 1923	J. LINDSAT, S. Af.	June, 1918
C. BIRELY, Md.	June, 1923	J. H. GIBBS, S. Af.	June, 1918
F. H. SHUPE, Penn.	June, 1923	W. W. BRIDGES, Ark.	June, 1918
J. C. STOVER, Penn.	Apr., 1923	Ed. HOLLAND, Queens.	May, 1918
W. SCHOONOVER, Pa.	Apr., 1923	H. L. HASWELL, N. C.	May, 1918
LOWNSDALE BROS., Mo.	Mar., 1923	H. S. YONGUE, Wash.	Apr., 1918
J. CARSWELL, Ark.	Mar., 1923	W. WELLHAUSEN, N. D.	Apr., 1918
G. E. GLAZIER, Ohio.	Mar., 1923	W. H. CHIPMAN, Mo.	Apr., 1918
T. BRADLEY, N. S. Wales	Mar., 1923	A. P. STROBEL, N. Y.	Apr., 1918
I. T. NBERDHAM, Ill.	Feb., 1923	E. H. ALBERTY, Penn.	Apr., 1918
G. C. DISINGER, Miss.	Feb., 1923	J. R. JEFFRIES, Pa.	Apr., 1918
J. HUGHES, Ohio.	Feb., 1923	R. COLVIN, Ind.	Apr., 1918
J. WIEBER, Minn.	Jan., 1923	J. B. JEFFRIES, Pa.	Apr., 1918
Z. A. ENOS, Kan.	Jan., 1923	J. LIPPERT, Ill.	Apr., 1918
W. G. WISE, Cal.	Jan., 1923	OTTO TIETZ, S. Africa	Apr., 1918
F. S. BISHOP, S. Africa	Jan., 1923	H. J. FISHER, Mich.	Mar., 1918
S. P. HARNET, Mont.	Dec., 1922	Geo. SMITH, N. Z.	Mar., 1918
W. BRECKNER, Okla.	Dec., 1922	Aug. HOLSNAGEL, Ore.	Mar., 1918
J. PABIAN, Neb.	Dec., 1922	A. E. UHRLING, Wis.	Mar., 1918
P. FREDERICKSEN, Iowa	Nov., 1922	P. J. THORNTON, N.W.T.	Mar., 1918
L. O. LEBUS, Ill.	Nov., 1922	J. C. YOUNG, Pa.	Mar., 1918
W. LAWSON, N. Z.	Nov., 1922	D. C. HOUCK, Ohio	Mar., 1918
W. H. MILLER, Iowa	Oct., 1922	J. MOLITOR, Ill.	Feb., 1918
A. O. MARTIN, Idaho	Sept., 1922	F. P. FELLOWS, N. Y.	Feb., 1918
O. A. MORTIMORE, Idaho	Sept., 1922	J. W. STEADMAN, Ohio	Feb., 1918
H. J. WYATT, Wash.	Sept., 1922	J. P. HOLLAPPEL, Penn.	Feb., 1918
J. N. SKOW, Ia.	Sept., 1922	E. N. GATES, Vic., Aus.	Feb., 1918
A. D. STANDIFORD, Wash.	Sept., 1922	RENTON WAGON WKS., Wash.	Feb., 1918
T. TENKIEWICZ, Que.	Sept., 1922	WHITTING Fdy. Equip. Co. Ill.	Feb., 1918
A. PFUEFFER, Ohio	Aug., 1922	J. P. KOENIGS, S. Dak.	Feb., 1918
W. D. VALENTINE, Iowa	Aug., 1922	RICHARD BRENNER, Tex.	Feb., 1918
G. HOFFMAN, N. Y.	July, 1922	W. F. HILL, N. C.	Feb., 1918
J. ERMAN, Ark.	July, 1922	J. B. BETTEL, Me.	Jan., 1918
W. K. W. HANSEN, Pa.	June, 1922	W. MISCABLE, Queen, Aus.	Jan., 1918
ROBERT TOCHTER, Cal.	June, 1922	S. PORTELANCE, Que.	Jan., 1918
J. VAN MANTER, N. Y.	June, 1922	D. C. FOLEY, Cal.	Jan., 1918
E. ANDERS & SON, S. Aus.	May, 1922	GLEASON BROS., La.	Jan., 1918
LOUISA CARRIAGE WKS., Va.	May, 1922	C. E. KRUG, Wis.	Jan., 1918
S. SMITH, Tex.	Apr., 1922	G. E. WOODARD, Kan.	Jan., 1918
J. W. HAAR, Ia.	Mar., 1922	P. J. DALLY, W. Aus.	Jan., 1918
E. A. DILLON, Nev.	Mar., 1922	J. MORROW, Pa.	Jan., 1918
D. W. SMITH, R. I.	Mar., 1922	F. PROCTOR, Tas.	Dec., 1917
D. F. KUSTER, Wash.	Mar., 1922	J. G. JOHNSON, Ill.	Dec., 1917
G. F. JOHNSON, Mich.	Feb., 1922	F. E. EGLERS, Ohio	Dec., 1917
R. H. KEITH, Ia.	Jan., 1922	C. T. FORREST, Cal.	Dec., 1917
O. M. JOHNSON, Minn.	Oct., 1921	THEO. BUSH, N. Y.	Dec., 1917
H. FELDUSE, Neb.	Sept., 1921	J. T. ELLIOTT, Ill.	Dec., 1917
W. K. KLINE, Kan.	May, 1921	J. VOELPEL, Ill.	Dec., 1917
J. L. JESTER, Mo.	Jan., 1921	W. J. MAIN, Cal.	Dec., 1917
R. S. CRISLER, Ky.	Jan., 1920	G. J. SAUER, Mo.	Dec., 1917
ED. GRIMM, Tex.	Mar., 1920	MESS BROS., Vict.	Dec., 1917
T. P. CONSIDINE, Mass.	Dec., 1920	E. BLOOMER, Aus.	Dec., 1917
J. NAIMITH, N. Zealand	Nov., 1919	H. P. ADAMSON, N. Zealand	Dec., 1917
THEO. PASCHEK, Neb.	Apr., 1919	F. R. TOMLINSON, Kan.	Nov., 1917
I. M. TOWNSEND, Cal.	Apr., 1919	KAYE & AINLEY, Eng.	Nov., 1917
G. BISH, Fiji Islands	Apr., 1919	T. H. ZIEGLER, Wis.	Nov., 1917
C. WILLIAMS, W. Aus.	Mar., 1919	SCHOLLER BROS., Ind.	Nov., 1917
R. TAYLOR, N. Z.	Feb., 1919	E. M. WURSTER, Mich.	Nov., 1917
ROBERT COOK, Ky.	Sept., 1918	S. Z. FREY, Ind.	Nov., 1917
A. B. WENDLANDT, Wash.	Sept., 1918	B. A. STEINER, Ohio	Nov., 1917
A. J. BROOKMAN & Co., Vic.	Sept., 1918		
PETER COCKS, W. Aus.	Sept., 1918		

NAME	Subscription Paid to	NAME	Subscription Paid to
J. N. BATHGATE, N. Dak.	Nov., 1917	C. J. HALL, Wash.	Dec., 1916
W. H. HOUGHTON, Pa.	Nov., 1917	BOB FRICKE, Ala.	Dec., 1916
W. T. CUTKOMP, Iowa	Oct., 1917	JOBBS BROS., Tex.	Dec., 1916
J. DELAUS, Neb.	Oct., 1917	R. CLEMENS, Conn.	Dec., 1916
Geo. POTSCHEK, Mo.	Oct., 1917	SCHREFFEL & SCHMITT, Pa.	Dec., 1916
J. W. RAPS, N. Y.	Oct., 1917	A. BRADSHAW, Ohio	Dec., 1916
W. C. RONEY, Pa.	Oct., 1917	J. E. BEATTY, Mo.	Dec., 1916
J. N. MILER, Ky.	Oct., 1917	Geo. CASSIE, Scotland	Dec., 1916
W. A. WILSON, N. Z.	Sept., 1917	JOHN KAIN, Ky.	Dec., 1916
R. ROSS, N. S. Wales	Sept., 1917	F. W. HOWELL, Ill.	Dec., 1916
I. E. SPROUD, Me.	Sept., 1917	H. A. CHEEVER, N. H.	Dec., 1916
FRED. BLOHM, Tex.	Sept., 1917	J. ROBERTSON & SON, Scot.	Dec., 1916
Geo. B. HEATON, N. J.	Aug., 1917	W. M. GRIFFITHS, Aus.	Nov., 1916
CLARK & FAUSETT, Queens.	Aug., 1917	W. B. TAYLOR & SON, Mo.	Nov., 1916
C. L. HOCKETT, Cal.	Aug., 1917	G. WHITTEN, Mass.	Nov., 1916
H. C. STENIEL, Tex.	Aug., 1917	J. M. VINCENGA, Wis.	Nov., 1916
M. DEJAGER, S. Africa	Aug., 1917	TOM NOLAN, S. Aus.	Nov., 1916
F. HOWARD, Kan.	Aug., 1917	H. J. FRENCH, N. Z.	Nov., 1916
H. FERREL, Ill.	Aug., 1917	F. N. BROWNING & SON, Ky.	Nov., 1916
J. MCMEIKEN, N. Z.	Aug., 1917	P. MACULAB, Scotland	Nov., 1916
F. H. GIERKE, S. Aus.	Aug., 1917	J. GESSER, Ill.	Nov., 1916
A. L. PITTINGER, Ill.	Aug., 1917	J. W. GRIBBLE, S. Aus.	Nov., 1916
F. G. STONE, S. Africa	July, 1917	W. G. SIM, N. Z.	Nov., 1916
H. J. DEVONSHIRE, N. Z.	July, 1917	H. V. RUEHL, Ala.	Nov., 1916
V. J. HUBBARD, N. Y.	July, 1917	G. LINDSBOG, Ind.	Nov., 1916
J. C. SKINNER, Vict.	July, 1917	PITTMAN STELL, N. C.	Nov., 1916
D. SHAVER, N. Y.	June, 1917	J. S. FINKENBERGER, Ind.	Nov., 1916
W. R. GELLING, S. Africa	June, 1917	R. D. WILSON, N. Y.	Nov., 1916
J. H. BAKKER, S. Africa	June, 1917	J. MIKULIK, Tex.	Oct., 1916
A. R. HALLENBERG, N. Y.	June, 1917	C. W. SCHMIDT, Cal.	Oct., 1916
F. C. BOCK, Neb.	June, 1917	T. J. MAGUIRE, N. Y.	Oct., 1916
P. VANDERHAGEN, Mich.	May, 1917	A. W. WATTS, Cal.	Oct., 1916
YOST & HALVORSON, Minn.	May, 1917	C. W. ELLIS, Tex.	Oct., 1916
W. MCOT, Kan.	May, 1917	J. P. SIMMON, N. S. Wales	Oct., 1916
A. GUSTTLER, Tex.	May, 1917	E. A. KNAPP, N. Z.	Oct., 1916
C. F. J. LORENZ, N. Y.	May, 1917	T. J. HASKIN, N. S. W.	Oct., 1916
A. DATWYLER, Ohio	May, 1917	LOTHIAN & SKINNER, N.S.W.	Oct., 1916
F. PETTIT, Okla.	Apr., 1917	W. B. KNOUFF, Ia.	Oct., 1916
H. G. MARRIOTT, Utah	Apr., 1917	GORMAN BROS., Ala.	Oct., 1916
E. THEBAUDRAU, Wis.	Apr., 1917	W. H. F. BRAUCH, N. C.	Oct., 1916
W. PICKERING, S. Africa	Apr., 1917	CLARK OLDS & CO., Neb.	Oct., 1916
Ed. BURROWS, England	Apr., 1917	IRWIN SCOTT, N. Y.	Oct., 1916
L. KAUSCH, Wis.	Apr., 1917	C. E. DURHAM, Kan.	Oct., 1916
J. M. BROWN, Tex.	Apr., 1917	M. RINGO, S. Africa	Oct., 1916
W. BAGLEY, Mass.	Mar., 1917	W. DELLEY, Queens, Aus.	Oct., 1916
B. E. CAMPBELL, Mass.	Mar., 1917	C. D. HUNS, Pa.	Oct., 1916
P. RUPFER, Ill.	Mar., 1917	T. M. BLACKMAN, Pa.	Sept., 1916
G. STANSKE, Wis.	Mar., 1917	G. H. TORLINE, Kans.	Sept., 1916
W. H. MILLER, Mo.	Mar., 1917	S. B. PHILLIPS, W. Va.	Sept., 1916
J. C. WOODS, W. Aus.	Mar., 1917	G. E. HARPER, Texas	Sept., 1916
C. BOULTON, N. S. Wales	Mar., 1917	J. J. ILLER, N. S. Wales	Sept., 1916
C. A. HAWKINS, Ore.	Mar., 1917	JAMES PORTGREN & CO., Mo.	Sept., 1916
A. L. MONTGOMERY, W. Va.	Mar., 1917	JNO. GORTINGER, Ia.	Sept., 1916
J. PETERSON, Ia.	Mar., 1917	Geo. FLOCKENSTEIN, Cal.	Sept., 1916
J. ANDERSON, Tas.	Mar., 1917	Geo. HILL, Aus.	Sept., 1916
A. J. NEILL, Vt.	Mar., 1917	E. C. BEARD, Aus.	Sept., 1916
ED. DETRICH, Ind.	Mar., 1917	J. K. GLINICKI, Mich.	Sept., 1916
LEWIS CHASE, N. Y.	Mar., 1917	OSCAR BURNER, Md.	Sept., 1916
E. O. LES, S. Dak.	Mar., 1917	A. J. HAMMOND, Cal.	Sept., 1916
S. STEPHLE, Ohio	Mar., 1917	ROBERT MURRAY, Cal.	Sept., 1916
R. S. GUGIBERG, Kan.	Mar., 1917	D. E. WRIGHT, Pa.	Sept., 1916
J. S. HASKELL, Col.	Mar., 1917	J. S. HASKELL, Col.	Sept., 1916
W. L. ROARE, Tex.	Mar., 1917	R. SOMMER, Aus.	Sept., 1916
A. R. BARLOW, Tex.	Mar., 1917	J. A. SQUINN, Can.	Aug., 1916
C. A. WHITACRE, Ohio	Mar., 1917	JAMES CLARK, JR., Aus.	Aug., 1916
B. P. CARNET, Ill.	Mar., 1917	DISPATCH Fdy. LTD., N. Z.	Aug., 1916
T. J. DORSEY, Conn.	Feb., 1917	A. A. BARKER, N. D.	July, 1916
F. MARSH, Mich.	Feb., 1917	ERNST E. DOTTY, Ohio	July, 1916
H. H. WHITE, N. H.	Feb., 1917	F. C. ASHTON, Pa.	July, 1916
McGOWAN BROS., N. Y.	Feb., 1917	HENRY FISHER, Tas.	July, 1916
W. H. SCHNNE, Neb.	Feb., 1917	J. W. FOWLER, N. Z.	July, 1916
A. J. H. WEGENER, S. Africa	Feb., 1917	A. C. LUDWIG, Cal.	July, 1916
H. SCHNETTKE, Ill.	Feb., 1917	J. K. HANSEN, Aus.	July, 1916
E. DOUGHAM, Ohio	Feb., 1917	J. B. BARKER, Ill.	July, 1916
J. W. HAUGHT, Ill.	Feb., 1917	H. M. LARSEN, Wis.	July, 1916
CHAS. F. GIERE, N. Mex.	Feb., 1917	Geo. P. MACINTYRE, Me.	July, 1916
M. E. GOLLER, Pa.	Feb., 1917	JAS. A. BUCHNER, Mich.	July, 1916
J. POTTHOFF, Neb.	Feb., 1917	H. M. FINGAR, N. Y.	July, 1916
G. M. GARRETT, Mich.	Feb., 1917	L. H. STRANGE, Vict.	July, 1916
ERNEST FINLEY, Pa.	Feb., 1917	P. O'DONNELL, Vict.	July, 1916
A. TILLMAN, Cal.	Feb., 1917	R. J. HANCOCK, N. Z.	July, 1916
WALKER BROS., N. Z.	Feb., 1917	F. G. WILSON, Calif.	July, 1916
G. W. WHITTINGTON, W. Va.	Feb., 1917	H. W. FRECHMAN, Mo.	July, 1916
J. H. HOYLE, S. Africa	Feb., 1917	A. J. YEAGER, S. D.	July, 1916
IRVING BROS., N. Y.	Feb., 1917	A. J. MOODY, Va.	July, 1916
F. ROSEY, Pa.	Feb., 1917	O. DYSTAD, N. D.	July, 1916
AUGUST MILLER, Ill.	Feb., 1917	J. NICOLAISEN, Conn.	July, 1916
C. P. ROBERTSON, S. Africa	Feb., 1917	J. BINEGGER, Tex.	July, 1916
O. DANNEMAN, Minn.	Jan., 1917	J. STADLER, Cal.	July, 1916
S. HETEM, S. Africa	Jan., 1917	W. HOWLEY, N. Y.	July, 1916
G. A. GURLEY, Ore.	Jan., 1917	C. NOWAK, N. J.	July, 1916
F. K. WADE, Me.	Jan., 1917	A. J. PRUE, N. Y.	July, 1916
L. V. SENN, Neb.	Jan., 1917	F. RINKENBERGER, Ill.	July, 1916
S. H. AUSTIN, N. Y.	Jan., 1917	J. K. LORAH, N. Y.	July, 1916
H. KARL, Ia.	Jan., 1917	J. HENDRICKSON, Iowa	July, 1916
J. H. BERGEN, Kan.	Jan., 1917	J. P. KELLY, Md.	July, 1916
F. G. A. WILLIAMS, S. Aus.	Jan., 1917	F. A. MARSTON, N. H.	July, 1916
B. S. CASEY, Mass.	Dec., 1916	GEORGE TURNER, Ill.	June, 1916
W. DENNER, Mo.	Dec., 1916	J. G. MUELLER, Mo.	June, 1916
J. B. SCHRIDLER, Ind.	Dec., 1916	A. MACHERCHER, Scot.	June, 1916
F. KUMMER, Ohio	Dec., 1916	J. E. STOREY, Penn.	June, 1916
ALFRED CASS, N. Z.	Dec., 1916	O. B. PETERSON, Wis.	June, 1916
H. GRIMM, Utah	Dec., 1916	H. J. EICHOERT, Mo.	June, 1916
A. H. GOODING, S. Aus.	Dec., 1916	H. L. FAST, Man.	June, 1916
LEONARD SMITH, N. J.	Dec., 1916	A. L. SCHELL, Mo.	June, 1916
C. F. SHAW, Mar.	Dec., 1916	E. E. TRINE, Penn.	June, 1916
W. ELWARD, Pa.	Dec., 1916	D. F. MCAULAY, N. S.	June, 1916
W. W. EGLY, Pa.	Dec., 1916	J. W. KIRKBRIDE, N. J.	May, 1916
JOS. BOYER, Mich.	Dec., 1916	G. W. STARR, Ill.	May, 1916
J. WILLIAMS, N. S. Wales	Dec., 1916	E. E. ELLSWORTH, Ill.	May, 1916
J. H. W. SCHNEIDER, Cal.	Dec., 1916	J. VERMILYER, Ore.	May, 1916
W. SAUER, Minn.	Dec., 1916	A. S. FORBES, Utah	May, 1916
F. F. DARLING, Cal.	Dec., 1916	J. O'ROURKE, N. Y.	May, 1916
CHAS. NEWLAND, Cal.	Dec., 1916	H. ROCKWELL, N. Y.	May, 1916
J. T. BRAHM, Ia.	Dec., 1916	W. RUSSELL, Conn.	May, 1916
P. H. ST. LOUIS, Wis.	Dec., 1916	J. I. DEFEW, Neb.	May, 1916
A. E. NICKOLA, Okla.	Dec., 1916	W. I. HASKIN, Okla.	May, 1916



An International Horse-shoe Competition

A prize of £100 (\$486) is offered by The Royal Society for the Prevention of Cruelty to Animals, through The Roads Improvement Association of England, for "the most practical and useful type of horseshoe that will provide the horse with a satisfactory foothold upon improved waterproof roads (thus alleviating its sufferings), and minimize the damage at present caused to such roads by certain types of shoes at present employed."

It is further stated in the circular announcing the competition that: "The merits of competing devices will be judged mainly on the following considerations:—(1) The provision of a satisfactory and non-slipping foothold for horses upon waterproof road surfaces now adopted upon main roads and the chief streets in cities and towns. (2) The reduction in the amount of damage caused to the road surfaces. (3) General practicability, such as;—capability of general manufacture, reasonable life, moderate cost and similar considerations.

"The competition being a novel one it is difficult to set out all the points to which attention might be called, but it may be suggested to competitors that, other things being equal, the advantage will lie with the device that can be manufactured or supplied at, or about, the price of the present shoes; that wears nearly as long as the shoes now employed, and that prevents the horse slipping without damaging waterproof road surfaces."

Every entry must be made on an official form to be obtained from the Secretary to the Roads Improvement

Association, (Incorporated), 15 Dartmouth Street, Westminster, London, S. W. A separate entry form must be filled in for each shoe.

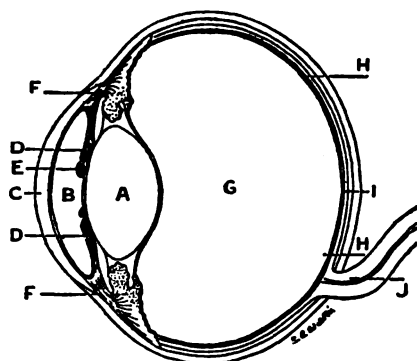
Unsoundness in Horses

(I)

H. C. WILKIE, F. R. C. V. S.

Unsoundness in horses is a very wide subject, indeed, and I purpose dealing with its different aspects as shortly as possible, in order to cover as much ground as I can and to present to you a general consideration of a very large subject

The question of unsoundness in horses has long since reached a very high importance, indeed, in all the



DIAGRAMMATIC SECTION OF THE HORSE'S EYE—PARTS TO BE EXAMINED

A. The lens.

B. The anterior chamber containing the aqueous humour.

C. The cornea—the glass-like covering of the front of the eye.

D.D. The iris—the brown curtain between the anterior chamber and the lens which has an elliptical aperture in its center—the pupil.

E. The *corpora nigra* or soot bodies. The marked development of these is peculiar to equine animals.

F. The ciliary process, suspensory ligament, longitudinal and circular ciliary muscles which are all concerned, not only in the attachment of the lens, but in the alteration of its convexities, in order to accommodate its focus to either near or distant objects.

G. The posterior chamber of the eye which contains the vitreous humour.

H.H. The *tapetum lucidum* is relatively situated between these two points, and is a portion of the back of the eye which, instead of being black as the other parts are, is of an iridescent greenish-yellow color. It is found in all herbivorous and carnivorous animals, and by acting as a reflector probably enables them to see in a dim light much better than man can do.

I. The retina upon which the picture of the image looked at is received.

J. The optic nerve, a nerve of special sense which conveys the impressions of light to the brain.

older countries of the world and in America.

Professional examinations for soundness are made prior to purchase,

in the buyer's interest, and one may safely assert that exceedingly few horses of any value change hands in any of the older countries without the guidance of expert opinion.

In all the leading, and many of the smaller, horse shows and agricultural shows of the world, every equine exhibit has to pass the test of a veterinary surgeon's examination before being allowed to go into the ring to the judges. This plan facilitates greatly the work in the ring, and gives a much increased value to the awards. During the years it has been in vogue it has greatly improved the standard of show form and has had a well-recognized influence in making those countries where it has been adopted the suppliers of stud animals to the rest of the world.

Another phase in the professional examination of horses for soundness is in the selection of stallions and mares for breeding purposes. Nothing is more disastrous to the horse breeding industry of a country than the continual handing down of hereditary disease from one generation to another, and, were we not daily face to face with the phenomenon, we should not think it possible that any man would deliberately breed from unsound stock. However, this is done constantly and to a large extent. There would appear to be two most potent reasons for doing so; firstly, that there is a desire for stallions at very low fees (usually an expensive kind of economy) and, the other, that often a man may have a well-bred mare with an hereditary unsoundness which he hopes by some happy perversion of Nature's laws may not be transmitted to her progeny. Such hopes are not well founded, and the practical breeder will pin his faith only to facts established by experience and not to remote chances.

It is quite difficult enough to breed first-class stock, anyhow, without taking in the handicap of hereditary unsoundness. The diseases known to be hereditary are: (1) Bone-spavin, (2) Ringbone, (3) Side bone, (4) Navicular Disease, (5) Roaring, (6) Stringhalt, (7) Shivering, (8) Multiple Recurrent Fibroids.

In the case of the first three there is a transmissible tendency not only to the production of these diseases but, owing to the inherited weakness of the bony tissue and the tendency to ossific deposition, to any of the



other troubles to which horses with "Soft Bone" are liable.

Navicular disease does not usually manifest itself until the horse has been at work some time, while hereditary roaring is frequently developed early. It would appear from many cases I have known, that in some mares there exists an anti-roaring tendency which can counteract the taint from the stallion.

One of the best known cases of this was Ormonde, most of whose foals, got in England, became roarers, but in America it is stated none of his progeny were affected.

Stringhalt and Shivering both are diseases of the nervous system which are serious unsoundnesses and should never be perpetuated by heredity. The principal effort which has been made in Great Britain by the State to encourage horse-breeding has been in giving King's Premiums to ap-

these approved horses to satisfy one tenth of the demand.

In the older and perhaps more sophisticated countries one of the duties of the veterinary surgeon to his client in examinations for soundness is to prevent him being made the victim of fraud.

The horse-coper is not confined strictly to any special grade of society; he is not by any means always a low-class dealer who would only deal in low-priced horses. He is found in some high class dealing establishments, and even in the ranks of the amateur. Indeed, I could mention one or two amateurs (but will certainly not do so) who add considerably to their income by selling horses, and who have brought the coping of horses to almost a fine art.

There are few portions of the horse's anatomy which are not at times operated upon for the temporary removal of defects of confor-

which "the man in the street" immediately condemns a horse do not in any way affect the work which the animal is called upon to do, while in another case an unsoundness may exist which is not to be detected by the unprofessional man, and which will render the horse perfectly useless in perhaps a few months' time.

It is quite as serious a mistake to condemn a useful horse for some blemish or abnormality which will never do the slightest harm as it is to pass an attractive looking horse with good action and incipient navicular disease.

It is then upon the detection and accurate estimation of the significance of certain conditions that the principal value of a veterinary examination for soundness depends. But as this involves such diverse subjects as anatomy, physiology, action, conformation, habits, knowledge of every form of deception, a quick, accurate sight, sense of touch, and of hearing, you will readily understand that it means many years of training, and such a subject can be dealt with in one lecture only in the merest outline.

Now, soundness does not mean perfection, or, I am afraid, we should never be able to find a sound horse.

It is now generally accepted that a sound horse is one which is free from any defect which diminishes his capacity for the work he is called upon to do, or is likely to so affect him in the future.

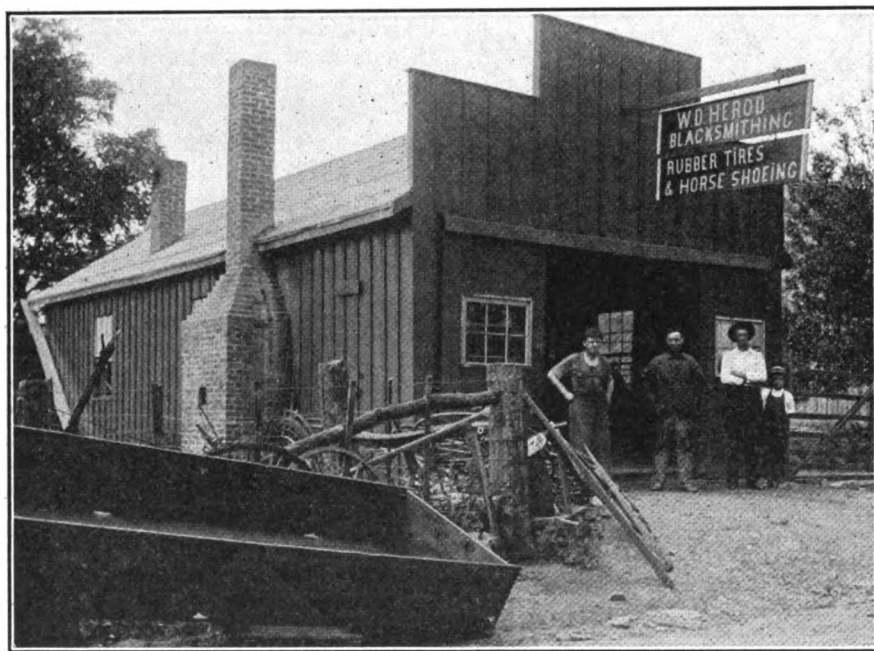
In the examination of a horse for soundness, it is very important to remember that there are unsoundnesses such as bone spavin, navicular disease, and very many others, which do not manifest themselves in action after exercise.

It is therefore of the very first importance that the horse to be examined should be cool, and should stand quietly in a stall or box for half an hour or so before examination.

He should be observed in the stable for the detection of weaving and other bad habits, and for the position he maintains during rest, by which many abnormalities are drawn attention to.

On turning the horse around with his head towards the door, the examiner is often able to at once detect such defects as chinked back, shivering, stringhalt, spavin, and others.

At this stage I usually examine the eye—the condition of the eyelids—



THE GENERAL SMITH SHOP OF MR. W. D. HEROD IN THE BLUE GRASS STATE (KENTUCKY)

proved horses which have been examined by experienced veterinary surgeons and passed, The knowledge that these horses are free from hereditary diseases has given confidence to farmers, and the only trouble about the system appears to be that there are not enough premiums given to supply the demand. In Yorkshire, for instance, there are, or were a few years ago, only three premiums. The country is divided up into large districts, and there are not enough of

mation, wind or action, and the professional examiner is of little value if he has not all these tricks at his finger-ends in order to protect his client from fraud and preserve his own reputation.

With regard to physical unsoundness, it is necessary that the examiner should have a wide experience to draw upon in order to properly estimate the significance of the different conditions with which he meets.

Many apparent unsoundnesses for



a contracted, triangular shape of the upper one indicating previous attacks of ophthalmia; the edges of the lids may be turned in as in entropium or outwards as in ectropium. The condition of the hair must be noted, and the inner portion of the eyelids by turning them up. The cornea must be carefully examined and the iris as to its power of contractility. The door of the box is then shut, and the condition of the lens, the vitreous humour, and the retina observed with an artificial light and an ophthalmoscope. The box may then be opened and the horse walked outside.

In addition to noting any peculiarities of conformation which may exist, the following are the chief points to be observed:—

Commencing on the near side of the animal—the poll must be examined for injury or poll-evil, and the position of the ears noted; deaf horses maintaining the ears in a forward listening position without the normal quick movements. The glands of the throat must be manipulated; and at this stage I usually take the pulse, noting its tone and regularity.

The nose next requires examination—for polypi, ulcerations, discharges, etc.; and while doing this the condition of the sinuses of the head and face must be tested, for they may be full of pus without any external swelling.

The mouth is then examined, and the age as indicated by the teeth is noted. The condition of the molar teeth should always be discovered, and this is neither a difficult nor a lengthy task with most horses if quietly and gently gone about.

The whole of the mouth and tongue having been examined, I usually test the jugular vein, raising it to see if it has been damaged by some previous bleeding, and then pass the hand over the withers, which require careful examination, injuries in this region being not uncommon, and not always easily seen.

A Phase of the Law of the Purchase and Sale of Merchandise

The following letter reaches me from New York State. The subject will be of general interest:—

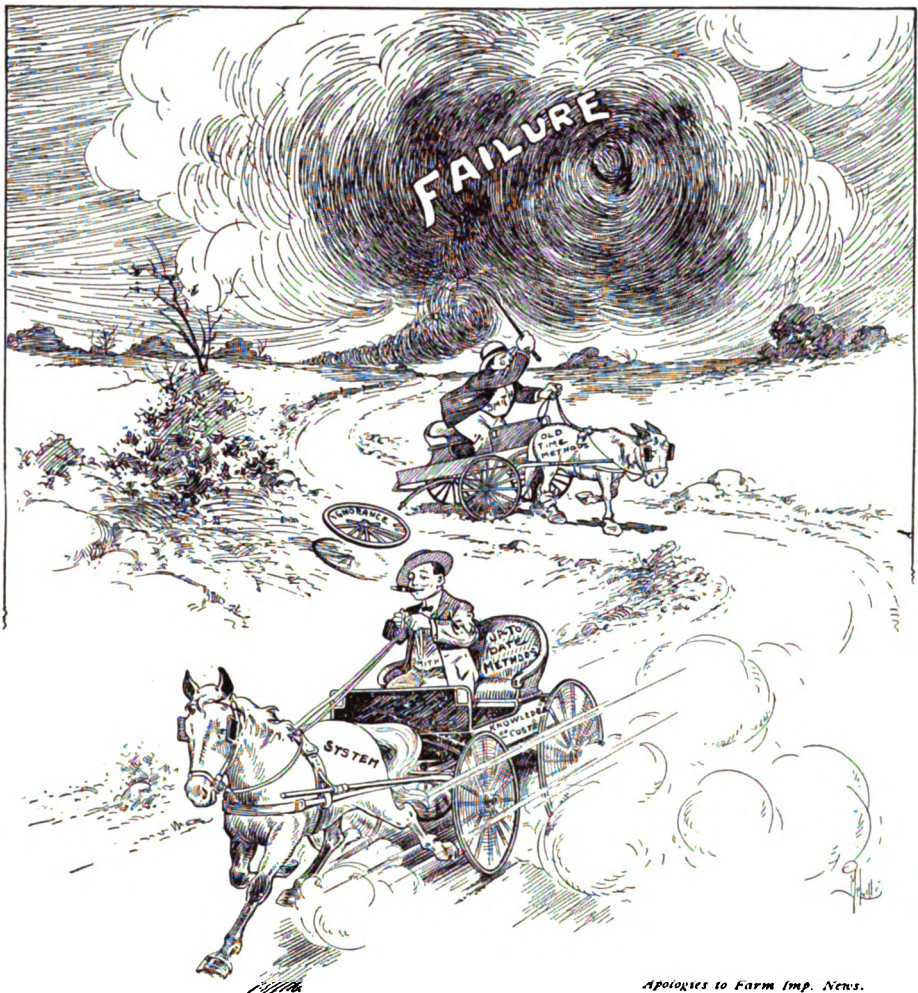
Please answer the following questions—

(1). Whether or not the *purchaser* is not responsible for goods shipped on his order, whether or not the goods are ever received by the purchaser? That is, if the seller ships the goods on the purchaser's order and takes receipt therefor from the carrier company, is not the purchaser or concern ordering the goods responsible for the bill?

must still pay for them, depends again on the terms of sale.

I can make this clear by citing two simple illustrations:—

1.—A is a jobber located in New York City, who obtains an order from B, located in Ohio. The goods are sold f. o. b. New York, which means free on board cars in New York. When A delivers them to the railroad



Apologies to Farm Imp. News.

WHICH MAN WILL BE OVERTAKEN BY THE STORM?

(2). If goods are lost in transit, is not the carrier company absolutely responsible for the value thereof to the *purchaser*?

If these points have not been covered in any of Mr. Buckley's articles perhaps he would cover them specially in an early article.

The question to whom goods belong while they are enroute from seller to buyer depends on the terms between the parties. Sometimes they are the property of the seller and sometimes they are the property of the buyer. Of course if anything happens to them the claim upon the railroad must be made by the owner. Whether, if they are lost, the buyer

company in New York City, his contract is completed, and in the eyes of the law the goods are then delivered to B, the buyer, and they are in his constructive possession all the time they are en route. In this case the railroad company is the agent of B.

2.—The same parties enter into a contract for the purchase and sale of goods, but this time they are sold f. o. b. Smithville, Ohio, which means that A's contract is not completed until he carries, or gets them carried, to Smithville. In this case the railroad company is the agent of A, the seller, and the goods are in A's constructive possession during the whole time they are traveling.



In cases like the first, if the goods are lost, the loss is B's, because he owned the goods at the time. It is he who must make claim on the railroad, and he must pay for the goods whether he ever collects from the railroad or not, and he cannot wait until the railroad settles, either.

The same statement of course applies where the goods are not lost, but merely damaged.

In cases like the second illustration, the loss—if the goods were lost—would fall on A, the seller, because he owned the goods at the time.

the shipper is the bill of lading which the shipper gets when he delivers the goods for shipment. It is loaded with small type provisions which give the railroad as much as possible and the shipper as little as possible. Where goods are sold f. o. b. New York the buyer can not of course attend to getting them shipped, so the seller usually does it for him, in which case the bill of lading which the railroad gives the seller is still the contract binding the buyer, because in making shipping arrangements, the seller acted merely as the buyer's agent, and

by its own negligence, whether it has put the contrary in its bills of lading or not.

This means that under the present method of dealing between a railroad and a shipper the latter can hold the former responsible for lost or damaged goods *only when the loss or damage is caused by the railroad's negligence*, and sometimes the shipper must prove the negligence, which is often a hard thing to do. In other cases, however, all that the owner of the goods must do is to prove the delivery of the goods to the company, and the latter's failure to deliver them at their destination, or their delivery in a damaged condition. Then the railroad must show that loss or damage was caused by something other than its own want of care. If it doesn't do that, to the satisfaction of a jury, a verdict will be given against it. Negligence means lack of ordinary prudence and care.

How much can the owner collect if he collects anything? The measure of damages in case judgment is obtained against the railroad for the loss of the goods is the market value of the goods at the point of destination, not the point from which they were shipped. To the market value may be added interest, and from the sum of principal and interest the freight charges are to be deducted. Where the goods are simply damaged, the measure is the market value less the fair value of the damaged goods at the point of destination.

In case of damage through unwarranted delay, the measure of damage is the difference between the market value at the point of destination on the day when delivery should have been made, and the market value on the day when it was made. This is so whether the decline which may have occurred was due to a marked decline or a deterioration of the goods themselves.

(Copyright by Elton J. Buckley.)

An Improved Oxygen Acetylene Welding Plant—2

ALBERT H. WAYCHOFF
The Oxygen Generator

The list of materials necessary for making the oxygen generator is as follows. See Fig. 3.

1—Short piece of $\frac{1}{2}$ -inch pipe,

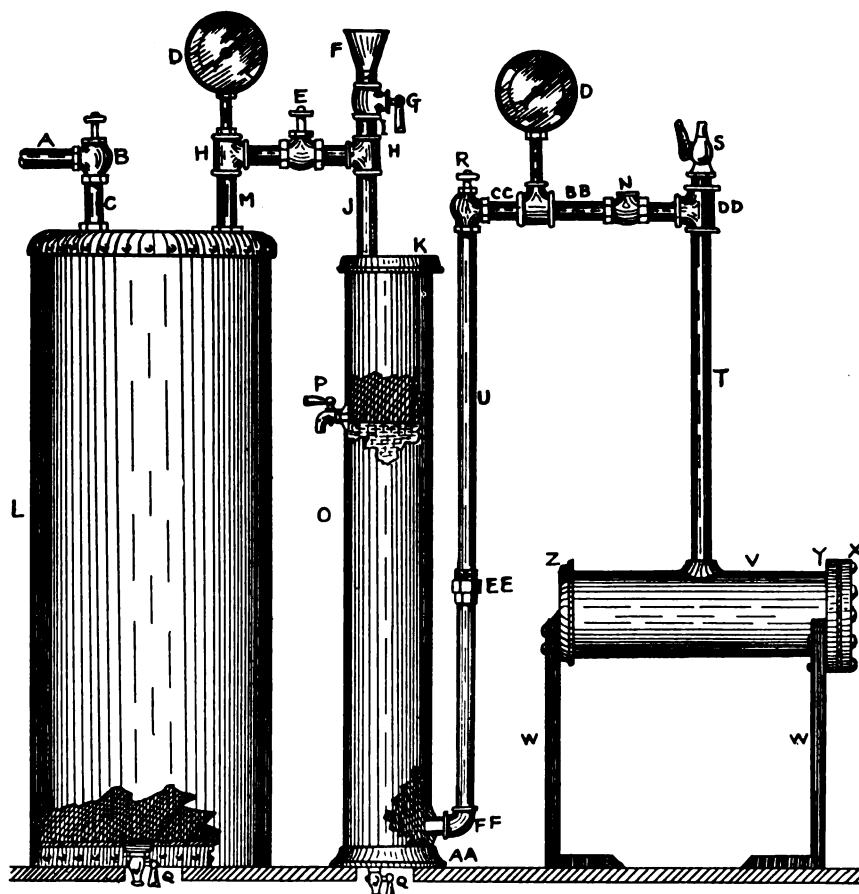


FIG. 3—SHOWING MR. WAYCHOFF'S IMPROVED OXYGEN GENERATOR

They had never left A's possession, and B would neither need to pay the bill or to care anything about it. This is also true in case of damage rather than loss.

Now as to the second question asked by this correspondent—is the railroad not absolutely responsible for the value of the goods in case they are lost while en route? The answer is—not necessarily. You can be very sure that if the railroad has been able to tie the owner of the goods up in a contract letting the railroad out in case of loss or damage, it has done so. The contract between a railroad and

the buyer must abide by what the seller did.

The law allows a railroad to put in the bill of lading provisions exonerating it from liability for loss occurring from everything except its own negligence. The policy of the law has always been to forbid railroad companies from making shippers agree not to hold it responsible for its own want of care (negligence), but a few of the States have lightened up a little on this, and are now allowing it to be done. Generally speaking, however, the policy of the law is still that a railroad must stand for losses caused

about 6 inches long, threaded at one end (A).

1—Angle needle point valve, $\frac{1}{2}$ inch (B).

1—Piece of $\frac{1}{2}$ -inch pipe, 6 inches long, threaded at both ends (C).

2—100 pound steam gauges (D)
(D).

1—1/2-inch globe valve (E).

1—Small funnel, soldered on an ordinary $\frac{1}{2}$ -inch coupling (F).

1— $\frac{1}{2}$ -inch cock (G).

4-1/2-inch T's (H), (H) and (DD),
(DD).

1— $\frac{1}{2}$ -inch nipple, 4 inches long (I).

1— $\frac{1}{2}$ -inch pipe to come level with (H). This may be cut and threaded when putting outfit together.

1—6-inch malleable cap, with hole tapped out for 1/2-inch pipe (K).

1—Stove or range boiler, 12 inches in diameter and 5 feet high (L).

1—Piece of $\frac{1}{2}$ -inch pipe, 12 inches long (M).

1—Piece of 6-inch gaspipe, 5 feet high (O).

1—Drain cock, for indicating water level in scrubber (P).

2—Drain cocks (Q).

1—Angle disk valve (R).

1—Pop safety valve (S).

1—Piece of $\frac{1}{2}$ -inch pipe, 4 feet long, threaded on both ends (T).

1—Piece of pipe with union (EE), total length, 5 feet 6 inches (U).

1—Piece of 5-inch pipe, 18 inches long, for retort (V).

2—Legs bolted on retort, 12 inches high (W)(W).

1—Plate to bolt on flange (Y), for retort door (X).

1—Malleable 5-inch cap (Z).

1—Flange (Y).

1—6-inch flange and plate for bottom of scrubber (AA).

And several short pieces of 1/2-inch pipe which must be cut and threaded to fit as the generator is being put together. Also 1/2-inch elbow will be needed.

To make the generator (Fig. 3) take the boiler or tank (L) and plug up the side hole, then put in the two top pipes, as shown in the illustration, also the drain cock (Q) in the bottom.

Then take the piece of 6-inch pipe (O) and put on the flange and plate (AA) for the bottom and the malleable cap (K) on top. This is what is known as the scrubber, and must always contain water to the level of the drain cock (P). Then connect up the pipes between the scrubber and the reservoir as shown.

Then set up the retort on the legs (W), screw on the cap (Z), and the flange (Y), and tap a hole in the center for the 1/2-inch outlet pipe, then connect up as shown, and the oxygen generator is complete.

To use the generator see that needle valve (B) is closed, then fill the retort with the following:

4 pounds of Potassium Chlorate; 1½ pounds Manganese Dioxide, or in the same proportions if a larger quantity is desired in the retort. Then bolt on the head of the retort, putting an asbestos gasket between

After you have made sure to close the needle valve (B), and to open the disc valve (R) you are then ready to light the fire. It is also well to be sure that check valve (N) is all right. After the fire has been lighted a short time you will notice a sort of rumbling or bubbling in the scrubber, caused by the gas going through the water. When the pressure has reached the desired point, turn down the fire so that it will just supply the gas to the tank as fast as it is being used out. The working pressure of oxygen is from 20 to 40 pounds, according to

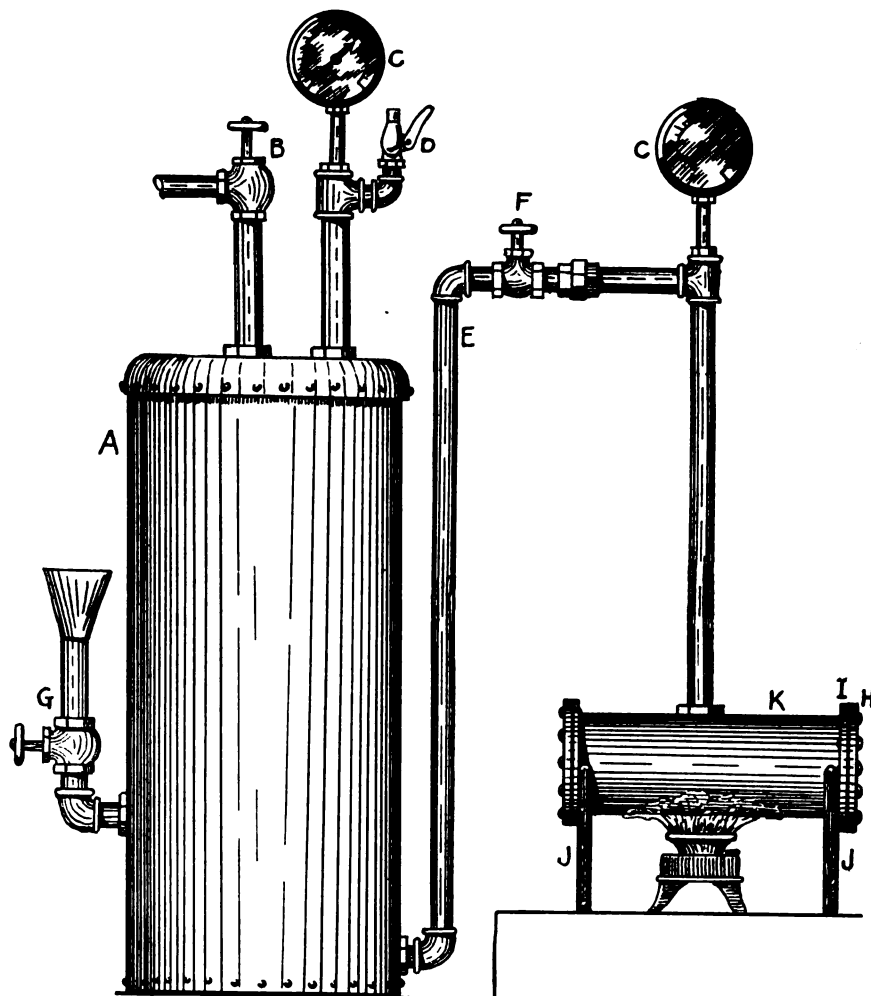


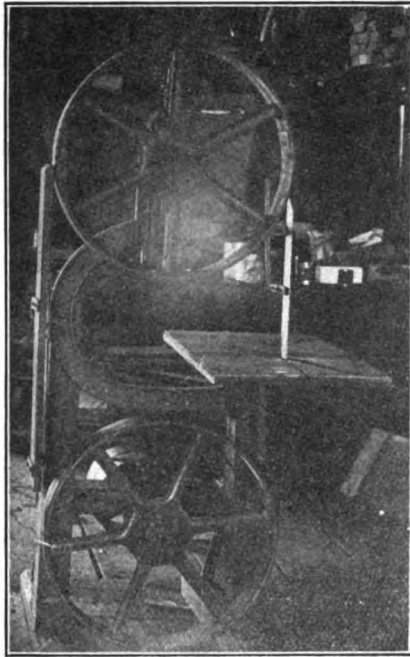
FIG. 4—A SIMPLE OXYGEN GENERATOR WITHOUT THE SCRUBBER TANK

the head plant and the flange. See that the valve (R) is open, and then place fire under retort.

The fire may be simply an ordinary gasolene stove, which the writer finds very successful, still, if the room be piped for gas, I believe it is really more satisfactory. A sheet iron hood should also be made to put over the retort to confine the heat; thus causing the oxygen to generate faster and better.

kind of work being done. This will be explained later. The safety valve should be set so as to pop at about 75 pounds.

Oxygen gas is not explosive or inflammable. When the chemicals—Chlorate of Potassium and Manganese Dioxide—have given off all their gas, the retort must then be cleaned out and a new charge put in. This is done by closing disc valve (R) and then removing plate from retort.



A SHOP-MADE BAND SAW

In order to tell when the chemicals have given off all the gas they will, leave the fire burning and gradually close disc valve (R). If the pressure goes up on the gauge between the retort and the scrubber, there is still gas being generated in the retort. In case the gauge between the retort and the scrubber shows a higher pressure than the gauge on the supply tank it shows that the pipes are plugged up with sediment of some kind, so that the gas cannot pass through readily. The scrubber is a necessity, as the gas passing up through the water is purified; making a much cleaner fire.

Always be sure to keep your Manganese Dioxide and Potassium Chlorate in clean, tight metal cans. As any trace of any vegetable formation with Potassium Chlorate might cause a very serious explosion. It may be of interest to mention that Potassium Chlorate and sugar, equal parts, form one of the strongest smokeless gun-powders; also with sulphur it forms a very violent explosive; so it will pay to be very careful with it and keep it perfectly pure and clean.

It is not necessary to buy the purest or what is known as chemically pure Potassium Chlorate and Manganese Dioxide for this purpose. The commercial grades do just as well and are much cheaper.

A good plan is to make a tray out of sheet metal of some kind, preferably copper, to fit snugly inside the retort. This is made by simply bending a piece of metal to a half round

shape to fit the lower half of the retort. This makes it much easier to clean out the retort, as the tray can be drawn out and cleaned on the outside and filled before replacing in the retort. The illustration at Fig. 4 is of another oxygen generator which is simpler to make, and if a large tank be used it is equally as good as the one in Fig. 3. The purpose of the scrubber is to make purer gas. The water absorbs the chlorine and other impurities from the oxygen while passing through it. The generator, Fig. 4, is briefly explained, as it is made the same way as Fig. 3, only the scrubber is omitted. A tank 24 inches in diameter should be used, and being kept half full of water makes a scrubber of it.

The oxy-acetylene torch and how to make it will be explained in the next installment.

(To be continued)

The Grading of Vehicle Wood Stock

The Hardwood Manufacturers' Association of the United States has just issued a copyrighted and revised edition of "Grading and Inspection Rules", which went into effect in May. For the benefit of our readers who are interested in vehicle timber stock we reprint portions of the book. These rules are practically the same as those adopted by the Spoke Manufacturers' Association and by the National Wagon Manufacturers' Association.

Hickory Vehicle Wheel Stock Definition of Terms in Rules for Grading Rims

Very dense growth is a growth in which the non-porous part of the annual ring

covers three-quarters of the area of the annual ring, and the remaining one-quarter contains a small number of pores.

A dense growth is one on which the non-porous portion of the annual ring occupies at least two-thirds the area of ring, and is slightly more porous than the very dense growth, and accordingly that timber which contains a less per cent. of non-porous growth and a larger per cent. of porous growth, is representative of a lower grade of timber.

BLEMISHES

A blemish is that which, while marring the appearance of the timber, does not affect the strength of the timber.

(a) Stains. A stain is a discoloration caused by improper care or handling, by improper piling, and by being left in the weather or on the ground during the warm or wet seasons.

(b) Iron Streaks. An iron streak is supposed to be caused by the infiltration of foreign coloring matter through bird pecks, and when it shows but slightly, apparently does not affect the mechanical qualities of the timber.

Bird Pecks—A bird peck is a slight defect caused by the bird pecking a hole in and through the bark of a tree, into which there settles foreign substances that discolor the timber, and when showing slightly, apparently does not affect the quality of the timber.

Bastard Rim—A bastard rim is one in which the growth or annual rings do not run parallel to the tread of the wheel.

Cross Grain—A cross grain piece of timber is one in which the growth or grain of the timber does not run parallel to the center line of the piece.

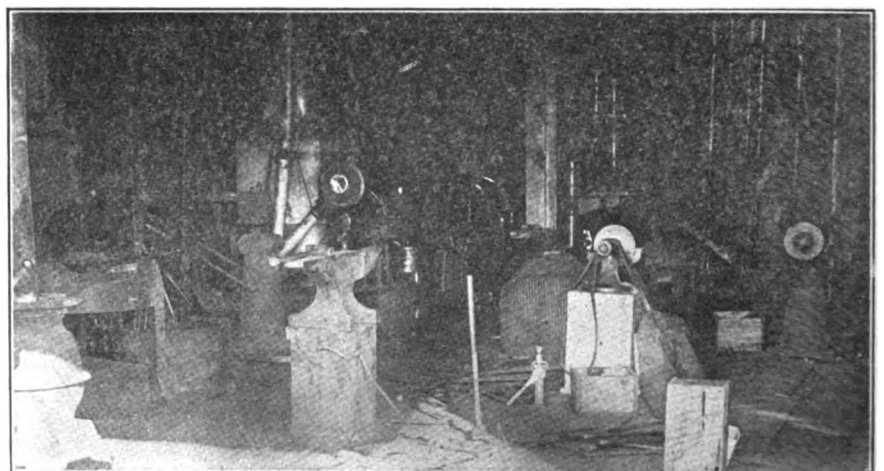
Sound Knot—A sound knot is one in which the wood is as solid as the wood surrounding the knot.

Short Curve or Dip in the Grain or Growth—A short curve or dip in the grain or growth is a curvature or deflection caused by a knot.

Snarl—A snarl is a twisted grain or growth in the wood.

Grub Holes—A grub hole is a hole about one-quarter inch in diameter, caused by grub worm boring a hole, usually lengthwise to the growth of the timber.

Powder Post—A powder post piece of hickory timber is caused by a very small worm that continues to work in timber after it has been cut, seasoned and even manufactured into the finished vehicle. While his work does not frequently appear on the outside, the inside may be entirely



THE GENERAL SHOP OF MR. T. B. HOLT OF OKLAHOMA



reduced to powder—hence the term “powder post.”

Worm Holes—A worm hole is a clean, open hole about one-sixteenth inch in diameter, and is easily visible, caused by a bug usually working in partly seasoned timber.

Sun Check—A sun check is a season check caused in seasoning and usually takes place in the best quality of timber. In some instances these checks are so very small that they do not impair the use or strength of the timber, and should be used at least in the lowest grade.

Rim Inspection

“A” GRADE

“A” grade is the first and highest grade. In rim strips of sizes $1\frac{1}{2}$ -inch square and smaller, the timber must be all white, of very dense growth, straight grain and free from streaks, stains and all defects; in sizes larger than $1\frac{1}{2}$ inch the timber may be either all white, or part red and part white mixed, of very dense growth, straight grain and free from streaks, stains and all defects.

The red timber in these large sizes must not exceed one half the size of the stick.

“B” GRADE

“B” grade is the second grade and must be practically straight grain of dense growth. Of all white and of red and part white and red timber. The red and part red and part white must be fully equal to or better in quality than the white in this grade.

All rim strips in this grade must be free from all defects.

“C” GRADE

“C” grade is the third grade and must be medium quality of either white, red, or red and white mixed timber. This grade will admit of timber of good quality not admitted in the “A” and “B” grades on account of cross grain, and all slight blemishes such as iron streaks and stains, but that are equal in strength to the clear strips of this grade.



THIS SMITH SHOP IN ILLINOIS IS RUN BY MR. LOUIS MINGES

Cross Grain. The grain shall not run in the length of the strip at any place at a greater angle than one inch in eighteen.

Short curves or dips in grain not to be included in this grade.

“D” GRADE

“D” grade is the fourth grade. The timber in this grade, although clear and straight grain, of white or red, or white and red mixed, is of a weight and quality not admitted in higher grades. Also strips of higher quality of timber equal in strength with the straight grain strips in this grade, but with blemishes, such as iron streaks and stains, and defects such as knots and bird pecks that are sound, also cross grain, provided the grain shall not run in the length of the strip at any place at a greater angle than one inch in twelve.

Short curves or dips in the grain with a length of less than 4 inches and more than $\frac{3}{8}$ -inch in depth will not be admitted in this grade.

Curves running longer than 4 inches and dips deeper than $\frac{3}{8}$ -inch would be considered cross grain.

“E” GRADE

“E” grade is the fifth and lowest grade, consisting of strips that can be used but such as are not admitted in the higher grades on account of quality of timber and defects. Strips with slight season checks should be used in wheels of this grade.

Strips with defects such as powder post worm eaten timber, open defects such as grub holes, checks, splits, bird pecks, snarls and otherwise unsound, and very brash timber such as has practically no fiber and strength will not be admitted to this grade.

Wagon Stock

STANDARD DIMENSIONS

The following dimensions given are the sizes adopted by this association for rough materials in the green state (unless otherwise specified) and are those in common demand by our members.

The star (*) prefixing any size indicates that that size is more in demand than the unmarked sizes.

Axles—Hickory

(6 feet long)

$2\frac{3}{4} \times 3\frac{3}{4}$	$3\frac{3}{4} \times 4\frac{3}{4}$	$4\frac{1}{2} \times 5\frac{1}{2}$
$*3 \times 4$	$*4 \times 5$	$*5 \times 6$
$3\frac{3}{4} \times 4\frac{3}{4}$	$4 \times 5\frac{1}{2}$	$5\frac{1}{2} \times 6\frac{1}{2}$
$3\frac{1}{2} \times 4\frac{1}{2}$	$4\frac{1}{4} \times 5\frac{1}{4}$	6×7

GRADING AND INSPECTION RULES

Adopted by the National Wagon Manufacturers' Association.

No. 1 OR WAGONMAKERS' GRADE

Grade—Live, tough black or shell bark hickory, cut 6 feet in length, to include all the clear and perfect stock.

Defects as follows admissible:

Stain—Penetrating not more than $\frac{1}{8}$ inch and which has not developed into a rotting condition.

Knots—Four sound pin knots, not exceeding $\frac{1}{4}$ inch in diameter, or two sound knots $\frac{3}{4}$ inch in diameter near the center line longitudinally on top or side and not over 12 inches of center or more than 6 inches of ends. Knots (except pin knots) not to be closer than 12 inches apart.

Splits—On either end, extending not more than 6 inches in axle or 3 inches on both ends.

Season Checks—Not more than $\frac{1}{2}$ inch deep and not more than 12 inches long.

Hearts or Heart Rings—None.

Shakes—That will plane out with $\frac{1}{8}$ -inch cut.

Worm Holes and Grub Holes—Not more than two pin worm holes not nearer than 6 inches to each other.

Bird Pecks—Bird pecks allowed if sound, or if unsound, part is not to exceed $\frac{1}{2}$ inch in diameter and not over $\frac{1}{4}$ inch in depth.

Wane—Axles with wane will be measured excluding the wane.

Sap—Bright sap considered no defect.

Grain—Grain can cross 3 inches in entire length of axle.

Defects Removable—If defects not admitted can be cut out so as to reduce axle to a smaller size used and ordered by the buyer it shall be so inspected.

Hewn axles shall be measured to square to the size they are ordered.

Defects at end of axles that will admit of piece work.

Maple Axles

(Sizes same as Hickory)

No. 1 OR WAGONMAKERS' GRADE

(These rules have not been adopted either by the wagon manufacturers or the mills,

but are suggested as being fair and equitable to both.)

To be cut from live, tough, hard maple (no bird's-eye or curly maple admitted), cut 6 foot and 12 foot lengths to include all the clear and perfect stock. Defects admissible same as for hickory axles.

Bolsters—Hickory or Oak

(Length, 4 feet 1 inch and 4 feet 6 inches or multiples)

3×4	$3\frac{1}{4} \times 4\frac{1}{4}$	$3\frac{3}{4} \times 5\frac{1}{2}$
$3 \times 4\frac{1}{2}$	$3\frac{1}{4} \times 5$	4×5
3×5	$3\frac{1}{2} \times 4\frac{1}{2}$	4×6
3×7	$3\frac{3}{4} \times 4\frac{3}{4}$	

RULES

Grade—To be cut from good, tough, straight-grained oak or hickory (when oak is specified it will be understood as being



THE MICHIGAN SHOP OF CURTIS & FISH

white or red oak), suitable for wagon material. To be clear and perfect stock, excepting the following defects, which will be admissible:

Stain—Penetrating not more than $\frac{1}{8}$ inch and which shows no signs of rot.

Knots—One sound knot not over $\frac{1}{2}$ inch in diameter, nor more than 12 inches from the center of the piece, or three sound pin knots not exceeding $\frac{1}{4}$ inch in diameter located in same manner.

Splits—None.

Season Checks—Not more than $\frac{1}{2}$ inch deep nor more than 12 inches long.

Heart Rings—None.

Shakes—If they can be planed out with $\frac{1}{8}$ -inch cut.

Worm Holes—Not more than 6 pin worm holes in a bolster, these holes not to be in cluster or more than 3 holes, 6 inches apart.

Bird Pecks—Allowed if sound.

Wane—Will be measured excluding the wane.

Sap—Bright sap accepted.

Grain—Grain can cross 2 inches in length of bolster as maximum.

Defects Removable—If defects not admitted can be cut out so as to reduce bolster to a smaller size used and ordered by the buyer it shall be so inspected.

Sand Boards—Hickory or Oak

(Length, 4 feet 1 inch and 4 feet 6 inches or multiples)

$2\frac{3}{4} \times 3\frac{1}{2}$	$*3 \times 4$	$3\frac{1}{2} \times 4\frac{1}{2}$
$3 \times 3\frac{1}{2}$	$3\frac{1}{4} \times 3\frac{3}{4}$	$*4 \times 5$
	$*3\frac{1}{2} \times 4$	

RULES

(Same as Bolsters)

Reaches—Hickory or Oak

$*2 \times 4$	8 ft. and 10 ft. long
$2 \times 4\frac{1}{2}$	8 ft. and 10 ft. long
$2\frac{1}{4} \times 4\frac{1}{2}$	10 ft., 12 ft. and 14 ft. long
$*2\frac{1}{2} \times 4\frac{1}{2}$	10 ft., 12 ft. and 14 ft. long
$2\frac{1}{2} \times 5$	10 ft., 12 ft. and 14 ft. long

RULES

Grade—To be cut from good, tough, straight-grained oak or hickory (when oak is specified it will be understood as being



white or red oak), suitable for wagon material. To be clear and perfect stock, free from knots, splits, hearts, grub holes, heart rings, shakes, bird pecks or wane. Bright sap accepted. The following defects will be admitted:

Stain—penetrating not more than $\frac{1}{8}$ inch and which shows no signs of rot.

Season Checks—Not over $\frac{1}{4}$ inch deep or 12 inches long.

Worm Holes—Not more than 6 pin worm holes in a reach, these holes not to be in clusters of more than 3 holes, 6 inches apart.

Poles—Ash or Oak

(For Drop Poles)

*2½ x 4 x 4 —12 feet

2½ x 4½ x 4½ x 4½ —12 feet

(For Stiff Poles)

2½ x 2½ x 2½ x 5 —12 feet

2¾ x 2¾ x 2¾ x 5 —12 feet

3 x 3 x 3 x 5 —12 feet

3¼ x 3¼ x 3¼ x 5 —12 feet

RULES

(Same as Reaches)

Eveners—Hickory

2 x 4 4 feet 2 inches long

2 x 4½ 4 feet 2 inches long

2½ x 4½ 4 feet 6 inches long

2½ x 5 4 feet 6 inches long

RULES

(Same as Reaches)

Bird Pecks—Sound bird pecks admitted.

Turned Singletrees

Oval Diameters

At Center

Light.....2 in. x 2½ in.

Medium...2¼ in. x 2¾ in.

Heavy....2½ in. x 3 in.

At Ends

1½ in. x 1½ in.

1½ in. x 1½ in.

1½ in. x 2 in.

Length

34 in. and 36 in. long

34 in. and 36 in. long

36 in. long

Turned Neck Yokes

Diameters

At Center

Light2½ in.

Medium.....2¾ in.

Heavy3 in.

At Ends

1½ in. 1½ in. 2 in.

Length

40 in. and 44 in. long

40 in., 44 in. and 48 in. long

44 in. and 48 in. long

No adopted rules for grading single trees and neck yokes, but stock must be absolutely clear and made from young, tough hickory.

Sawed Felloes—Oak

(26 pieces to set)

The sizes given are for green felloes cut full.

Sizes Most Common

1¾ x 2½ 2¾ x 2¾ 2½ x 3

*2 x 2¾ 3¼ x 2¾ 3¾ x 3

2½ x 2¾ 2¼ x 3 4½ x 3

* Circles 2 ft. 11 in. and 3 ft. 6 in.; 3 ft. 2 in. and 3 ft. 10 in.; 3 ft. 6 in. and 4 ft. 2 in.

RULES

Grade—Sound white or red oak, free from knots and other defects, except that $\frac{1}{8}$ -inch

stain will be allowed if said stain shows no sign of rot. Must be manufactured so that grain will run straight through center of each piece. Cut full sizes and proper circles.

Bent Rims

(8 pieces to set)

The sizes given are for green rims.

Sizes Most Common

1¾ x 1¾ 3 x 2 4¼ x 2¼

2 x 2 3¼ x 2½ 5 x 2

2¼ x 2 4 x 2 5¼ x 2¼

Circles 3 ft. 2 in. and 3 ft. 10 in.; 3 ft. 6 in. and 4 ft. 2 in.; 3 ft. 10 in. and 4 ft. 6 in.

GRADE

WAGON MANUFACTURER'S GRADE

(To replace what was formerly XXX)

These rules agreed upon jointly by the Wagon and Rim Manufacturers, November 21, 1906.

Materials—Oak (any desirable species).

Quality—Clear and straight-grained, but not excluding reasonably straight, the grain not to cross the rim in a less distance than 24 inches; to be sound, free from bark, wane, checks (except checks on tread side), shakes, splits, knots and worm holes, but admitting not more than three small, sound knots, not more than $\frac{1}{2}$ inch in diameter on tread side; also small worm holes not closer than 6 inches apart. Not over 15 per cent. of any shipment of rims shall be with knots or worm holes as above specified.

Workmanship—Planed on top and bottom sides; no skips, tears or imperfect planing. Bending to be on the true circle of diameter specified. To be free from flats or humps, kinks, breaks or buckles, and no straight or drop ends.

(Concluded in September)

Water Cracks in Steel Well-Drilling Tools

L. R. SWARTZ

In all tools of steel, and particularly in drilling tools, water cracks are due to three causes:

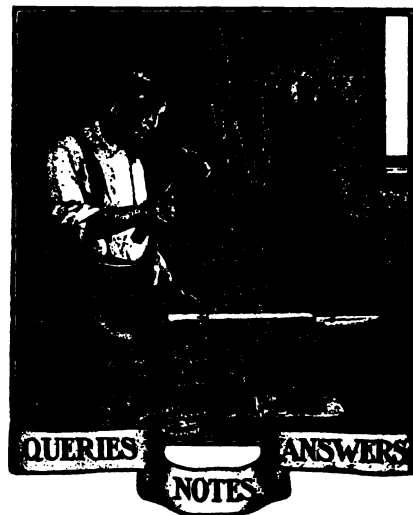
First, hurried heats which heat and often burn the outer parts of the tool while the interior is not sufficiently hot to stand forging into shape. This produces an uneven strain on the steel and, in hardening, such a heat is almost certain to cause water cracks.

Second, improper forging also tends to produce cracks, because the steel is not evenly worked and there is an uneven strain on the texture of the steel, so that cracks are the result. Hammering should be in proportion to the heat.

Third, too cold and too deep a bath sometimes produces cracks.

All these methods show a more pronounced effect on the better and harder grades of steel which contain a higher percentage of carbon, and we would advise that no bar of heavy steel is the same in temper throughout its length. Beside the difference in the grade of steel, there is another factor

of uncertainty, and that is there seems to be no grade of uniform steel used in the manufacture of bits. Different users use different grades of steel, and some users use several grades at one shop. However, it is advisable to make the bits as hard as possible and yet not break under the weight of the stroke of the drill. An authority on this subject advises that he makes a study of the nature of each bit he uses until he finds just what treatment it needs to produce the best results; and then he treats it in that way.



A Plow-Hardening Compound.—Kindly give me a recipe for a hardening compound for plow lays.

R. H. ANDERSON, S. Dakota.

A Drop Hammer.—Will you kindly inform me through the columns of your paper or give me an idea of the cost of a drop hammer to drop open-end wrenches and light forgings? Also the tools necessary to do that kind of work.

ROSS WIGHTMAN, New York.

What's Your Definition?—I would like to know through the columns of the paper just exactly what a scientific horseshoer is. A plain and full explanation of the title will be appreciated, as I want to show it to a man who claims he is a scientific horseshoer, but, in my opinion, he knows very little about the trade, for only recently he put hind shoes on the front feet of a horse. He is also a price cutter; shoeing for ninety cents when others are charging one dollar.

T. R. WOMBLE, Georgia.

Wants Shoe-Measuring Rule.—Will you kindly advise me through the columns of your paper whether or not there is any certain rule by which a horse's foot could be measured correctly? It seems to me that in this country, especially, there is too much guesswork about it, and the shoer just puts the rule over the foot and simply gets an idea, and uses his experience or judgment for the length of iron that is required to make the shoe. I would appreciate some information or discussion on the subject.

H. R. DENIZLE, New Zealand.

Well-Boring Tools.—Will some brother smith kindly give details on how to make tools for well boring—also how keys are made? J. THOMPSON, Massachusetts.



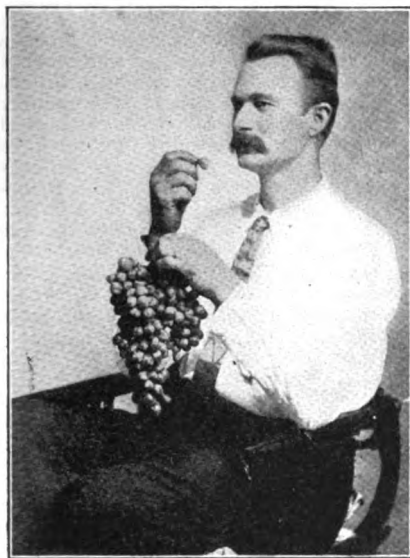
[Editor's Note.—To describe how tools for well-boring are made would require more space than can be devoted to this subject in any one or even three issues. A series of articles which were very complete appeared in the earlier issues of "Our Journal," and if Mr. Thompson will look through his back numbers he will find much of interest and value to him under the title of well-drilling tools.]

Wants to Get Rid of White Ants.—Will some reader of the paper please advise me how to rid my timber rack of white ants? Any information will be greatly appreciated.

JOHN H. TUCKER, Australia.

In Reply.—Practically the only things that appear to have any effect upon white ants are the fumes of arsenic and sulphur. If the timber itself is infested better subject it to the fumes of sulphur and arsenic in a closed room for some time. If the frame work of your timber rack shows the marks of the ants it is best to rebuild with treated timber. In any event, badly honeycombed timber would be absolutely unfit for use, though it had best be subjected to the arsenic-sulphur fumes to prevent the spread of the pests.

EDITOR.



MR. C. W. METCALF

A Letter From an Old Friend

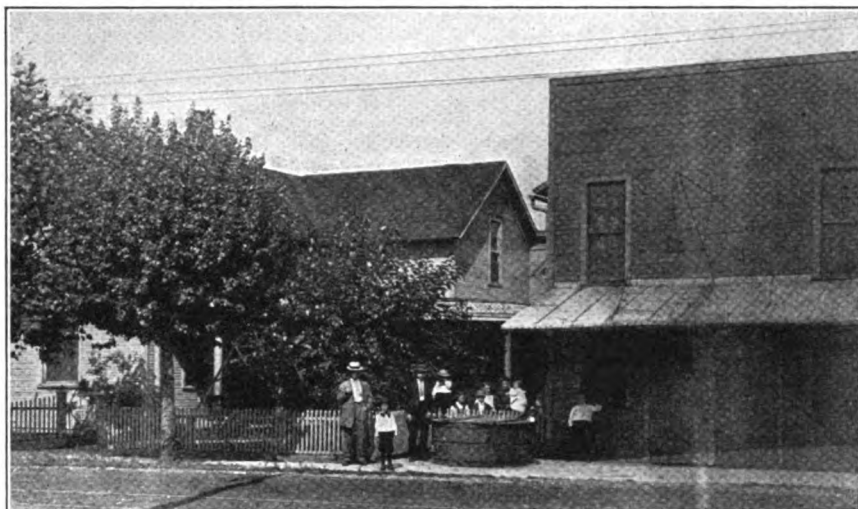
Well, boys, the lost is found. I am sending you a treat from one of the grape vineyards of California. I will again join the circle with some articles, but not at this time. I wish to give THE AMERICAN BLACKSMITH readers the praise—yes, and W. O. B. (I won't leave him out) for his good work in keeping the *good work* a-rolling. The paper hasn't lost one fraction; but on the contrary has gained several points.

Now a few words on side lines; some deal in one thing, and some in another, but that doesn't matter. My boss is handling mowing machines, and he says that if anyone catches him with a mowing machine next year he wants that person to shoot him.

Well, my side line is working ten hours for three dollars per day; and at night and on Sundays I repair watches and clocks, and take orders for new ones.

C. W. METCALF, California.

An Ohio Smith's Shop and Family.—The accompanying picture shows the front view of my home and shop. I have a two-



THE SHOP, HOME AND FAMILY OF MR. B. A. STEINKE OF OHIO

story smith shop, 26 x 30 feet; a one-story wood-work shop, 26 x 28 feet, and extra engine room, 12 x 14 feet. I have a four horse-power Perkins Engine with clutch; an emery stand; a rip and band saw; drill press, and last, but not least, a washing machine for the women folks. I also have a good stock of first-class tools. In fact, I keep everything on hand that is needed in the business, so that I am always prepared for any job that comes along.

B. A. STEINKE, Ohio.

Gasoline, Electricity and Coal.—We asked through "Our Journal" the difference in cost of operating a gasoline engine and an electric motor in the shop, and which was most satisfactory, but we have not seen anything on it yet. Come, Brothers, what is your experience?

We would also like to have the coal question brought up, to ascertain what kind of smithing coal is being used and why smiths are using certain kinds. I think coal is more important than most smiths realize.

THE FIX-IT SHOP, Utah.

[Editor's Note.—These items are all of

great importance to the practical up-to-date smith, and we hope that we will hear from both gasoline engine users and also the electric power users on the matter of power costs.

The matter of coal has been and always will be a live topic of importance with the smith. An exchange of views on the subject of good smithing coal cannot help but be of benefit to all.]

On Tempering Chisels.—Referring to an article in the April number in regard to tempering, I would like to ask Mr. C. R. Kemmerer if he has not made a slight mistake when he says to allow your temper to run to a pale blue, then dip and let it run out to a straw.

Now, in my experience, the straw comes before the blue. I bring the steel to a cherry red and never hold it in the same place in the water. I dip clear above the red, and the point will naturally cool quicker than the larger part; holding it in the water, as Mr. R. H. Gleason says, invariably causes water cracks for me. I had this same trouble in the mining camps, and when I stopped holding the chisel in one place and tried holding it in the tub a certain length of



A WELL-BUILT GENERAL SMITHING AND WOOD-WORKING SHOP OF NEW YORK STATE



time and then laying it down until it cools off, I had the best of success, and out of one hundred pieces of steel I have never lost more than five and have had them all stand.

Now, everyone cannot temper this way at first; you must learn just how long to hold it in the water, as the length of time varies according to heat.

I trust that my brother smiths will not take any offense because of me presenting my method and ideas, as I am not looking for an argument, and I think it is helpful to get the different methods that our brother smiths have success with, so that they can be tried out by others.

E. G. MENKE, Nevada.

Disc Sharpening and Tire Setting.—I could not get along without "Our Journal." After I have read it through, I read it over again in a day or two, and there is no use talking, it is the clear dope.

In the June number I read the article on disc sharpening. One brother states he can sharpen as many discs with a roller as with a cutter. Well, I have a Giant Wonder, and I can sharpen a disc while he is taking one

any more. The past generation were only paid small wages for their work and received nothing for their knowledge and the time they had to spend to learn the trade.

The coming smith will do his work with machinery, and someone will be obliged to pay for that. The young man of today cannot afford to spend three years to learn a trade which will only pay him two dollars per day when ordinary laboring men receive two-twenty-five for eight hours' work. The chances for the smith today are better than they ever were in my time, but the man must fit himself for the condition of the trade as it is today. The man who goes to his shop and sits down waiting for someone to come in to have something made will soon go bankrupt. In this stage of the trade the man who employs blacksmiths generally gets the profits of his work; but no one is to blame but the blacksmith himself. One will say the other fellow works that way and so will I if I expect to get the work. If these men who are capable of doing good work would stand on their merits and hold out for their price they would soon get people to listen to their pleas for fair play with other

something over \$1000.00 booked and the rest in cash. I have so far collected all but \$30.00, and aim to get that or proceed to dun. The main thing is to collect.

Our brother smiths should carry side-lines. We carry buggy whips, plow points, fencing staples, files, weed hoes, axe handles and hammer handles. We get several extra dollars in the run of a year. On our sideline we sell more plow points and buggy whips than our hardware man sells; but I must say before I close that I owe a great deal of my success to THE AMERICAN BLACKSMITH. It will put any smith on the top rung of the ladder if he will read it and heed its teachings. There is no reason why a blacksmith should not have some business methods of running his affairs, the same as a railroad or other large concern. He should know where his money comes from, and be sure he knows where it goes to. He should keep posted on the prices of his material and machinery. I saved over \$30.00 a short time ago by being posted on the price of one bill of machinery.

We do general work, horseshoeing, plow and wagon work, carriage painting and rubber tiring. I would be pleased to have some brother's ideas on carriage painting and rubber tiring. Most all the shops do carriage painting.

LEWIS & MOORE, Texas.

Replies to Several Queries.—I notice a number of questions recently which tempt me to offer a few suggestions to help out. Mr. T. J. Steadman asks in May number for a mathematical rule to set axles. I would refer him to the axle gauge described by Brother L. Van Dorin in the January number of 1910, pages 85 and 86, and I believe a little study will make it clear and plain to him. For convenience to use and adjust, it might be improved by making the part marked X, Fig. 1, in the engraving, forked so as not to slip off the axle when in use. Another improvement would be to use wing nuts and springs on the adjusting bolts instead of a jam nut.

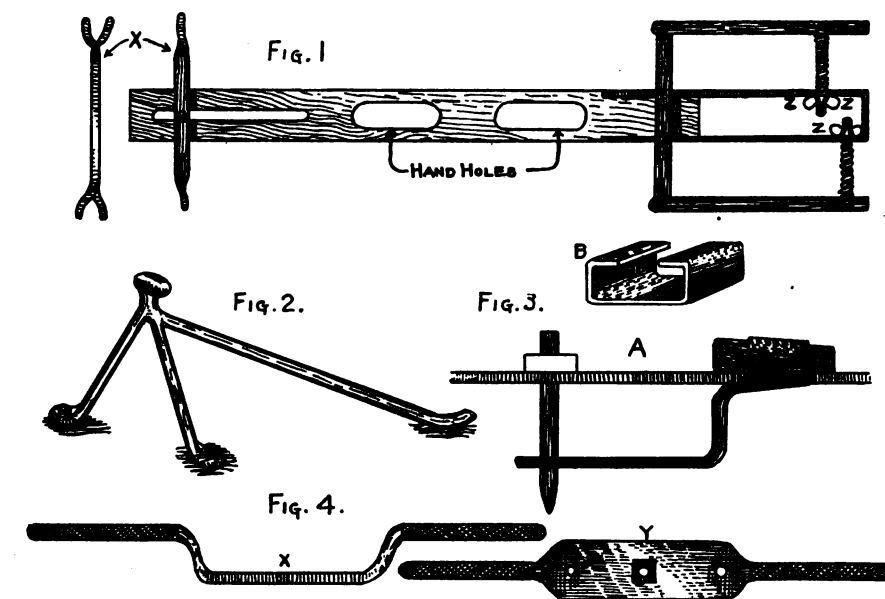
Fred H. Pettit wants plan of a plow bolt holder. The one described by W. O. Boettler, Vol. 5, page 154, does the work fine. I have held $\frac{5}{8}$ -inch landside bolts with this until they twisted in two. Make the handle part about 30 inches long, nick the head of bolt with a cold chisel and you can hold them securely. I have tried others, but this is the best.

The best horseshoers' foot stand I have seen is made as follows: Take 1-inch round iron 38 or 40 inches long, shape as shown at Fig. 2. Double a piece of $\frac{5}{8}$ -inch round and weld on as at A. For legs flatten out $1\frac{1}{2}$ inches at bottom for feet. The horse cannot pull this over backwards, on account of the long rear legs.

To hold harrow teeth from turning, take piece of steel (old buggy spring will do), and punch a square hole near one end, of a size to go two-thirds up on the taper of tooth. Bend the other end as shown in Fig. 3 to which rivet a piece of heavy band iron (B) $2\frac{1}{2}$ inches wide. Leave the opening at top wide enough to slip over channel-bar edgewise; slip over bar and onto tooth, push in wooden wedge as shown in A, Fig. 3, and you have it.

To make a good quick harrow wrench, take piece of steel $1\frac{1}{2} \times 1\frac{1}{2} \times 6$ inches, punch square hole in center, size of nut Y, Fig. 4. Weld a round handle on each end and offset $1\frac{1}{2}$ inch. Then take piece of $1\frac{1}{2} \times \frac{1}{8}$ inch band iron, drill $\frac{5}{8}$ -inch hole in it (Fig. 4), drill for small rivets at ends and rivet on top of nut hole in wrench. It works like a tap wrench, and the offset saves the knuckles.

LUKE BLABEY, British Columbia.



MR. LUKE BLABEY REPLIES TO QUITE A FEW QUESTIONS

apart and putting one together. I sharpened 52 sets this spring and got \$3.00 a set, and my machine only cost me \$20.00, whereas a roller costs from \$125.00 to \$200.00.

As to tire setting, I have used a Scientific for the past two years, and will say that it is as good a machine as there is on the market. Of course, you cannot set all tires cold. For instance, take a three-inch tire that has rust underneath, you set it cold and in pounding it you jar the rust, more or less, and when the job is finished and in use for awhile, the chances are the tire will become loose. This no one can help. Now I consider the best way is to take it off and set it hot, and then you have a job which when finished will invariably hold. Of course, some narrow tires and a few buggy tires can be set cold to advantage, but when the spokes are loose and need wedging, it cannot be done successfully, for I have tried both ways.

R. H. ANDERSON, S. Dakota.

The Smith of the Future.—The day for new conditions in the smithing field is fast approaching. There are no blacksmiths

mechanics. Owing to the trade having so many branches it is hard to form a union without running into specialties, and it seems when we start doing that we don't know when to stop.

I feel that THE AMERICAN BLACKSMITH has done the trade a great deal of good.

W. B. KIRKER, Ohio.

Business and Our Journal.—I think that "Our Paper" is worth more to us than we can realize. I have read other blacksmith papers, but THE AMERICAN BLACKSMITH beats them all. It doesn't overlook the office-end of the shop—which is the most important. There is good advice for any business man in our paper.

I can turn to my records and tell a man how many tires I set in 1912; how much cash taken in; how much put on the ledger; tell fully how much paid out for freight, drayage, etc. All smiths ought to keep a record of their business. I can turn to my books and tell a man how much I booked; how much cash taken in this month, last year; so you see I can tell whether I am going up-hill or down. We ran something over \$1500.00 last year



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How Our Journal Pays

When a paper gets right down to rock bottom solutions for your problems you may know that such a paper is the one you want. THE AMERICAN BLACKSMITH doesn't theorize on the way a thing should be done but gets right down to the job with the how, the why and the wherefore.

As Mr. Williams of North Wales says: I had a horse afflicted so badly with corns that it seemed cruelty to work him. I tried everything I knew of until one day when looking over "Our Journal" I came across an article on just the thing that troubled the animal. I followed the advice and really the change was nothing less than marvelous. In fact it was a complete cure."

That's how "Our Journal" works. Tells you how and then shows you how. And if you follow directions you'll generally come out O. K. THE AMERICAN BLACKSMITH pays its readers because its pages are heaping full of sound, practical shop information that you can use today on today's job. Tell your neighbor.

That July Number

July, you'll remember, was Our Annual Shop Number. To say that it was the best ever is stating the matter mildly, for we began receiving letters of praise ever since the mailing of the first copy and they're still coming in.

Mr. W. H. Fogwell of Galena, Md., says: "I would not take five dollars for this month's issue if I could not get another."

Mr. T. M. Rice of Maryland says: "While your past numbers have been good and some excellent, the current issue is most decidedly head and shoulders above them all."

And so we could go on for several columns had we the space to spare. But we can simply show you these few to let you know that others also thought that July Shop Number was "pretty good."

Subscription Agents

When a stranger solicits your subscription to THE AMERICAN BLACKSMITH, or any other publication, insist upon his showing you absolute proof that he is an agent in good standing and is employed by the publication which he represents. Don't, under any circumstances, give the man your money if you are not sure that he really works for the paper he says he does. No matter what the man offers you—no matter what price he makes—no matter what premium he promises to send—DON'T GIVE HIM YOUR MONEY IF YOU ARE NOT SURE.

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Volume Twelve—Done

This number of "Our Journal" marks the closing of the twelfth year of THE AMERICAN BLACKSMITH—twelve years of constant, ceaseless adherence to the cause and interests of the smithing craft. Never since the beginning have we lost sight of our policy to serve the interests of readers first, foremost and always. And we have led, rather than followed, in establishing reforms, in adopting new ideas and in pushing those matters which have been for the good, for the best and for the welfare of the good, old craft.

For example—THE AMERICAN BLACKSMITH was the first smithcraft paper to encourage smiths to enter the automobile field. "Our Journal" was the first smithing paper to add an automobile department and to give its readers information on how to care for and repair automobiles.

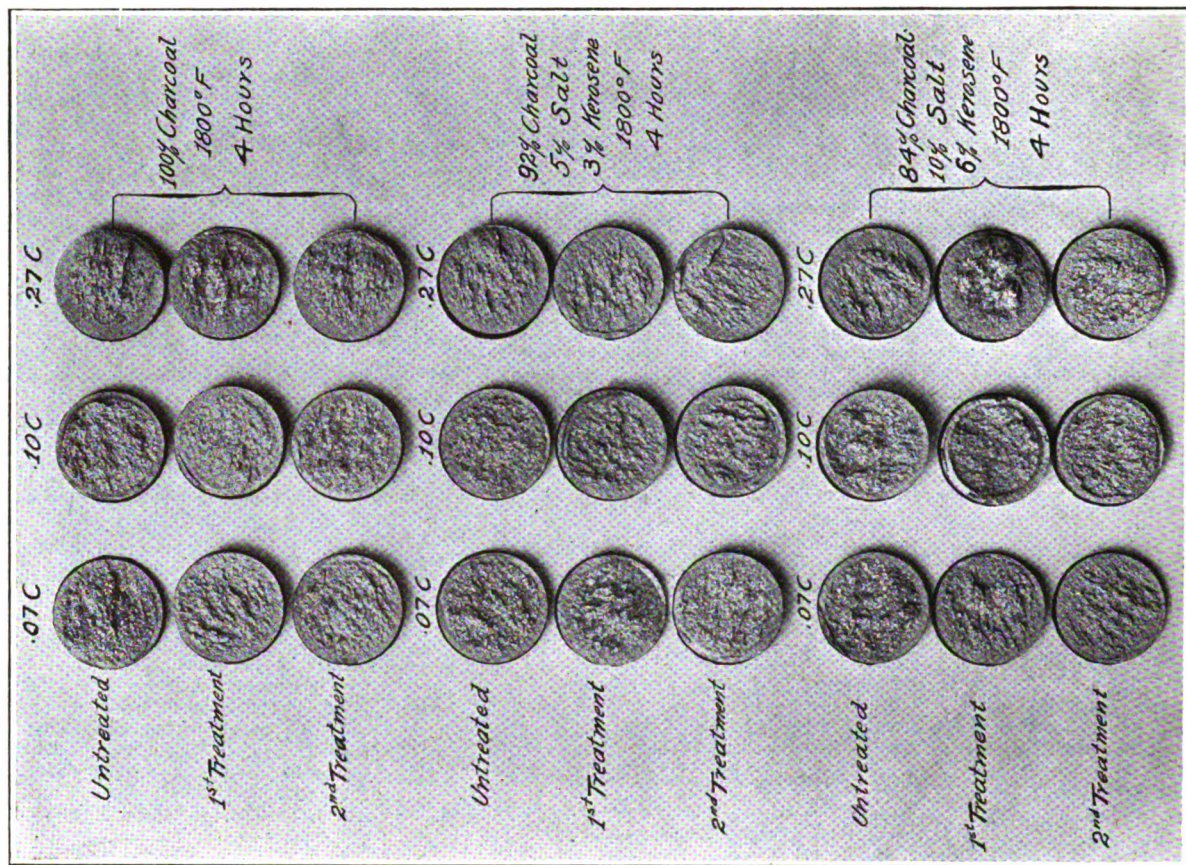
And more recently THE AMERICAN BLACKSMITH has devoted special attention to the business end of the shop and has gotten right down to the root of many matters that have been thought hopeless problems for years and years. In this we are again first and comparatively speaking alone. THE AMERICAN BLACKSMITH has had to fight tradition, so to speak, in its campaign for better business methods. But the results of the work are beginning to show and smiths, not only in this country, but in the other English speaking countries where "Our Journal" is read, are beginning to realize that proper business methods hold the key to the majority of the problems in the craft.

These are but suggestions of what THE AMERICAN BLACKSMITH has done in its campaign for better craft conditions, better profits for smiths and better workmen, and are by no means an indication of what the future has in store. Don't think, Mr. Reader, that we are ready to rest. The coming year will see still greater advances both in the craft and in "Our Journal." Next month we hope to tell you of some of the things we contemplate doing.

The Feature Article

The principal article of this number is on case-hardening—an article by Mr. John Jernberg who has already given us several thoroughly practical articles on case-hardening and other subjects.

Mr. Jernberg is connected with the Washburn Shops of the Worcester Polytechnic Institute and was assisted in these experiments by Mr. Jacob L. Mueller. Their work in these experiments and their notes on the results obtained should be of inestimable value to those of our readers who are interested in case-hardening and steel working.



PHOTOGRAPHS WERE TAKEN OF THE FRACTURES OBTAINED FROM THE SAME SPECIMENS THAT WERE USED TO DETERMINE THE DEPTH OF THE FILE-HARD CASE. THESE ENGRAVINGS SHOW THE FRACTURES AFTER FOUR AND EIGHT HOURS OF TREATMENT



Time and Material in Case-Hardening Operations

JOHN JERNBERG—JACOB L. MUELLER

Worcester Polytechnic Institute

DURING the last few decades and at present, when the universal aim of designer and manufacturer is directed to the highest efficiency of the product, a problem of a peculiar nature is sometimes met with.

For a simple illustration, consider a pair of toothed wheels or a chain and sprocket, transmitting power. In either case, strength and durability are manifestly essential in order to safely transmit the power and retain the true surface of the tooth for the sake of efficiency.

Upon a little reflection, it will become evident that, to meet such a condition satisfactorily, a material of a dual nature should be employed; something that possesses strength and resistance to wear, and still conforms with standard practice of design regarding the proportion of parts. Such problems have centered the attention of the manufacturer and investigator upon the problem of case-hardening. It is not a new subject, but a subject that is, so far, imperfectly understood, and not absolutely controllable. The above statement is justified by the diversity of opinion of various investigators in regard to the fundamental principles underlying the process of case-hardening.

The process consists, as the name would imply, of forming a carburized "case" capable of hardening on the surface of a low carbon steel which, in itself, has not the property of taking on hardness. The prevailing theory is based on the following principles:—

1. The steel to be carburized must be placed in contact with a carbonaceous material;

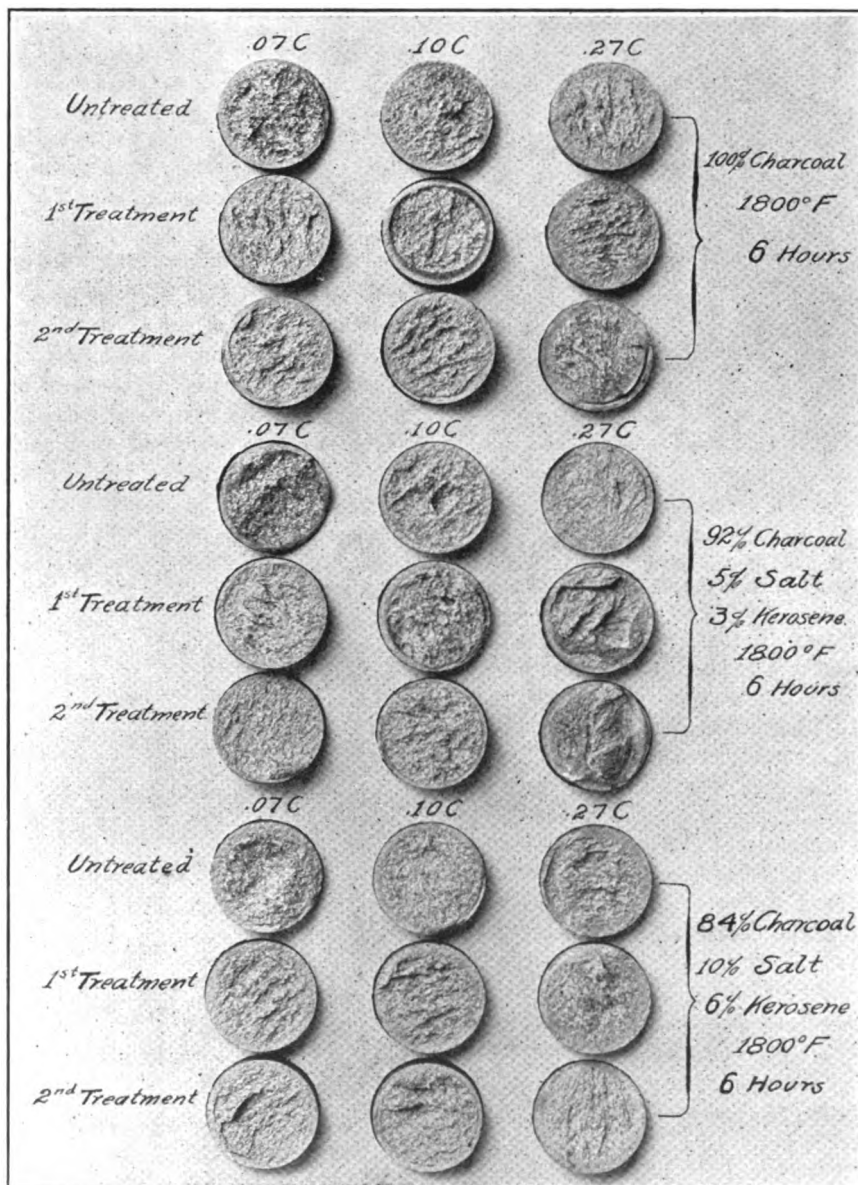
2. The high temperature at which the steel and carbonaceous material are heated gasifies the carbon (if in a solid state) and opens the pores of the metal, allowing the gaseous carbon to penetrate;

3. The penetration is aided if the gas is under pressure and in presence of some nitrogenous matter, acting as a carrier of the carbon.

The most important factor involved in case-hardening is the carbonizing material, for upon it depends the quality of the case and uniformity of the product. The great difficulty, at the present time, is to obtain a definite, predetermined result, and duplicate it at will. Many investigators are engaged in the solution of this problem, which will eventually be solved by the discovery

of a reliable carbonizing material.

In the older process, charred organic matter, such as wood charcoal, charred leather, bone, horn and the like, was used for packing. Charred leather, being relatively rich in nitrogen, gave the best result; but leather scraps found their application for other purposes, thus becoming unavailable for carbonizing. Granulated bone was next resorted to and is

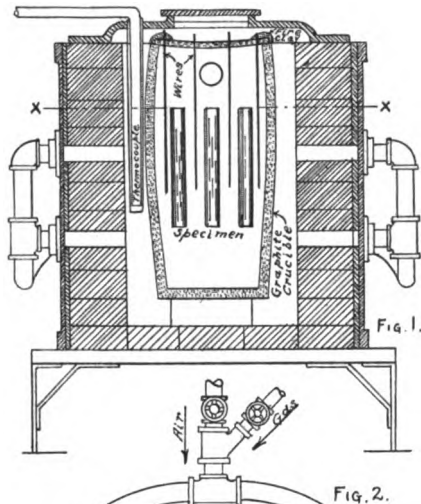


ANOTHER PICTURE OF HOW THE VARIOUS SPECIMENS BROKE, SHOWING THE CASE AND CORE TEXTURE AFTER SIX HOURS' TREATMENT



extensively used at present. Charcoal does not seem to find much favor, although it is fully as efficient as bone if properly prepared.

All of the materials mentioned above are, more or less, unreliable for producing a desired effect on the steel. Then, what would constitute a reliable packing material? Before replying directly, consider the fac-



FIGS. 1 AND 2, SHOWING BOTH FURNACE AND CRUCIBLE IN SECTION

tors that hinder the uniform carburization of the steel by bone, charcoal, or similar prepared compounds.

1. Unequal heating of the steel due to the manner of packing. It takes considerable time for the heat to penetrate to the center of the retort containing the steel and packing. Consequently, the parts near the walls of the retort are heated sooner and carbonizing begins earlier;

2. Unequal composition of the packing, causing a variation in the amount of gas and, therefore, pressure generated at different sections of the retort.

Now, to obviate these troubles, we need a material of perfectly uniform composition and high conductivity. It should liberate the carbon freely, yet not too rapidly. The steel will

absorb the carbon at a certain rate depending on the temperature; if an excess of carbon is liberated, the surface of the steel becomes supersaturated with carbon, resulting in a brittle structure. The case should not contain more than .9% C. Furthermore, the packing should be free from sulphur holding materials, especially if moisture is present. About 12% moisture will cause a rough surface; the sulphur acidifies the moisture and the combined effect produces a scaled, pitted surface.

There is a variety of case-hardening compounds on the market claiming one or more of the ideal characteristics. In general, these compounds consist of—

1. Carbon.
2. Volatile matter and hydrocarbon.
3. Nitrogen.
4. Ash.
5. Sulphur.
6. Phosphorus.

They are likely to contain silica, alumina, lime, ammonia and carbonates.

Statement of the Problem

The object of this investigation is to make a study of the effect of time and carburizing materials upon the effective penetration of the carbon. The material experimented with is a mixture of kerosene, salt and charcoal, in varying proportions as will appear further in the discussion. The charcoal is of a special quality, expressly prepared for case-hardening by the Springfield Facing Company.

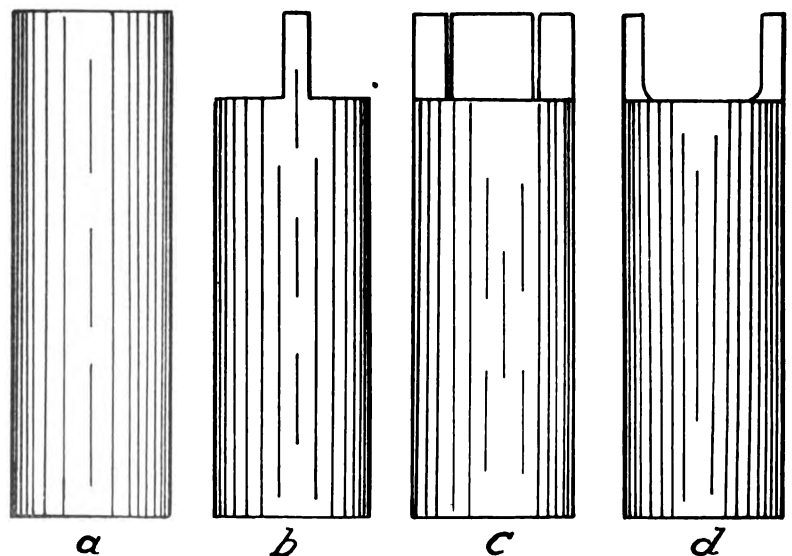


FIG. 4—SHOWING HOW THE DEPTH OF THE FILE-HARD CASE WAS DETERMINED

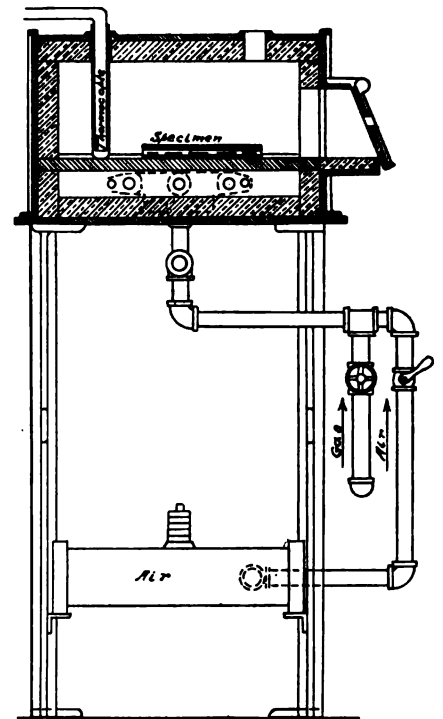


FIG. 3—THE FURNACE USED FOR HEAT TREATMENT

In the introduction, mention was made of the fact that in order to control case-hardening to a reasonable extent, a uniform packing material is absolutely essential, and this requisite is anticipated in the manufacture of the charcoal here employed.

The charcoal is burned from birch and maple wood, which is freed from bark and decaying portions before it is placed in the kilns. Special care is taken to keep out all dirt and refuse which is liable to collect in charcoal manufactured for ordinary purposes. After leaving the kilns, the charcoal is crushed and screened into



four sizes. The grade which was used in these experiments corresponds to what may be called No. 3. The important point in regard to this charcoal lies in the fact that it is reliable so far as its own composition is concerned; and having determined the most efficient proportions of the other

furnace is gas-fired. City gas and air, under about 2 lbs. pressure, are brought in contact and mixed at the Y connection as indicated in Fig. 2. At that junction, the mixture divides, one half of it entering through the port at each side of the furnace into the combustion chamber. The ports are flared toward the inside to give the entering mixture a direction tangential to the surface of the crucible, and thus scatter the incandescent gases throughout the combustion chamber.

The steel was packed in a graphite crucible, a section of which is shown in Figs. 1 and 2. Unfortunately, a graphite crucible is the only kind that will endure the heats above 1700° F. for a considerable period of time. Wrought iron crucibles can be used advantageously for temperatures of about 1300° F. to 1400° F. Any metal crucible will deteriorate very rapidly, due to the oxidizing action of the air coming in contact with it. A graphite crucible is, relatively, very expensive, and not quite satisfactory. It is fragile and must be handled with considerable care. It resists the destructive action of the heat to a marked extent; but as soon as deterioration begins, the crucible depreciates very rapidly. The crucibles used in these experiments began to fail at the fourth heat—each heat running for 8 hours at 1800° F. The surface cracked and peeled in large, thick scales, so that at the ninth heat the thickness of the walls was reduced by about 50%.

The type of furnace used for hardening and treating the carbonized steel is shown by Fig. 3. It consists of a heating chamber lined with fire brick, the latter being encased by a cast iron shell. A cast iron bridge extends throughout the length of the heating chamber, upon which is placed the specimen to be heated. The method of supplying the fuel—gas and air—is clearly shown in the diagram. The mixture of gas and air divides at a T junction, and enters each side of the combustion chamber through a manifold. Combustion takes place between the bridge and the bottom of the heating chamber. The air is stored in the cylindrical tank shown near the bottom of the furnace, Fig. 3; by varying the weights on the relieve valve, the pressure under which air is supplied can be varied.

The objection to this furnace for hardening purposes is the impossibility of preventing the steel from oxidizing during the heating. For many kinds of work this defect is immaterial, but when it is desired to preserve a clean surface, a muffle furnace should be used for hardening.

Method

Of the three leading variables involved in case-hardening, viz. time, temperature and packing, temperature was kept constant at 1800° F. and time and packing were varied. The temperature of 1800° F. was

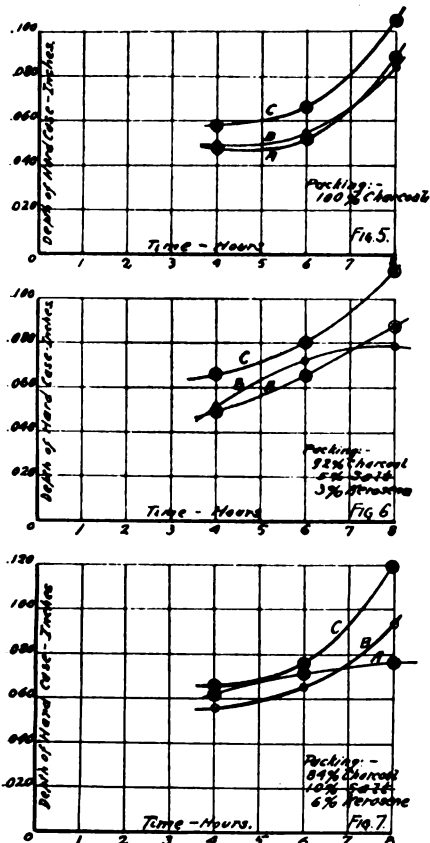


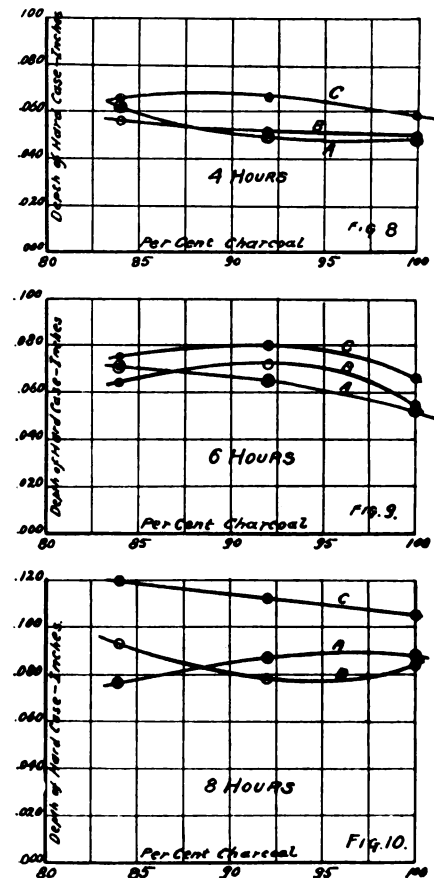
FIG. 5, 6 AND 7—SHOWING RESULTS IN FIRST SERIES

constituents relative to each other, and conjointly to the charcoal, there is no reason why uniform results could not be obtained. There are certain precautions, however, which must be observed when using charcoal for carbonizing material, and they will be discussed more fully in due order. Owing to the prevailing opinion that the addition of salt and kerosene to charcoal aids carburization, these experiments were divided into two series:—

1. To prove the above statement true.
2. To determine which of the two constituents has a predominating influence.

Description of Apparatus

The furnace used for carbonizing the steel is shown by Figs. 1 and 2. It is a circular crucible furnace lined with fire brick, separated from the external steel plate shell by a layer of sand to provide for expansion. The



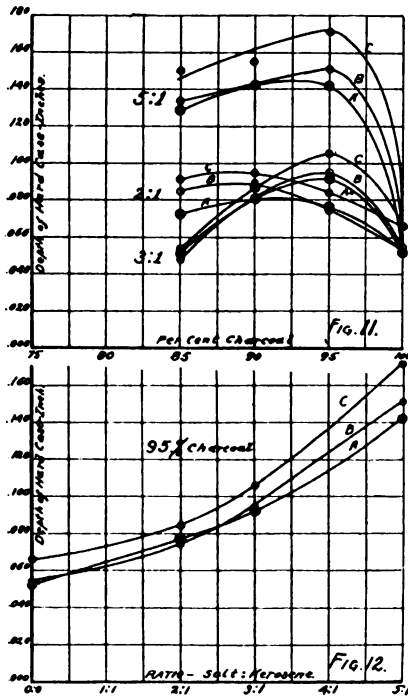
FIGS. 8, 9 AND 10—SHOWING RESULTS IN FIRST SERIES

chosen as being about the mean between the lowest and highest temperatures at which case-hardening is performed.

The three grades of steel used were of the open hearth process, having the following composition:

	A	B	C
Carbon	.07%	.10%	.27%
Manganese	.46	.70	.86
Sulphur	.058	.106	.026
Phosphorus	.034	.096	.020

The test pieces B and C were cut 8 inches long from 1-inch round stock, and then turned to $\frac{1}{8}$ -inch diameter. Specimen A was turned from a $1\frac{1}{4}$ -



FIGS. 11 AND 12—SHOWING RESULTS IN SECOND SERIES

inch billet to $\frac{1}{8}$ -inch diameter, the length being also 8 inches. All specimens were ground before carbonizing to provide a uniform surface, and marked at both ends for identification.

The method of packing the samples is clearly shown by Figs. 1 and 2. They were arranged in a circle, about 2 inches away from the wall of the crucible and spaced about 1 inch from each other. The packing material was introduced gradually and thoroughly tamped down with an iron rod. This is a very important and necessary precaution which must be observed to obtain a satisfactory result. After heating the contents of the crucible a shrinkage takes place, which amounted to about 16% of the total volume in these experiments. Now, if the specimens are not packed tightly, some of them, or portions of them, are liable to be exposed and no appreciable carburization will result on the exposed surfaces. This statement simply reverts to the principle involved in carburizing with a solid material, viz.: there must be solid carbon in contact with the steel and an intervening gas to effect carburization.

Having carefully packed the specimen, the crucible was covered with a cast iron lid and luted with fire clay. This operation, if neglected, will cause a total failure in carburizing. If the crucible is not sealed, the gases

formed inside will escape, which means, eventually, the absence of one of the principal elements in carburizing, viz.: the "intervening gas."

The length of time required for heating the crucible to the carburizing temperature was determined by the wire method. Wires, $\frac{1}{8}$ -inch in diameter, were inserted through suitable holes in the cover into the packing mixture. Fig. 1 shows the manner in which the wires were distributed; these wires were drawn one by one at different intervals and the temperature inferred from the color of the wire. The effective heating was counted from the time the wires indicated that the packing material was thoroughly heated to the carburizing temperature. The average time required for heating up the crucible and packing material was two hours.

In the first series of experiments nine runs were made; the first three at 4 hours, the second three at 6 hours and the last three at 8 hours. For each period of time as stated above, three packing mixtures, varying in percentage composition were used, the variation being the same for each 4, 6 and 8-hour run respectively. For

illustration, one heating period—say 4 hours—will be considered in detail. The first packing was pure charcoal in which the specimens were packed with due precaution as already outlined. The crucible is then placed into the furnace, the latter closed at the top and heating begins. When the wires indicate that the crucible and contents are at the proper temperature—1800° F.—4 additional hours are allowed. The time was so chosen that the furnace could be shut off at about five o'clock in the afternoon and the crucible with contents allowed to cool over night.

The next run was made with a packing mixture consisting of 92% charcoal, 5% salt and 3% kerosene, the proportions being chosen at random. The third run was made in the same manner as the first and second, but the packing mixture consisted of 84% charcoal, 10% salt and 6% kerosene. The 6 and 8-hour heats were run exactly like the 4-hour heats just described, the proportions of the packing mixture remaining the same for a given heat of each period.

For every heat six specimens were packed in the crucible, or two for

	4 Hours			6 Hours			8 Hours		
Packing	A	B	C	A	B	C	A	B	C
C=100	.047	.054	.068	.049	.054	.065	.084	.090	.104
S=0	.052	.048		.056	.048		.089	.087	
K=0	.049	.046	.048	.048	.058	.067	.088	.081	.106
	.044	.049		.057	.058		.090	.079	
Mean	.048	.049	.058	.052	.054	.066	.088	.084	.105
C=92	.044	.046	.064	.068	.078	.086	.090	.082	.114
S=5	.049	.050		.068	.073		.090	.083	
K=3	.051	.055	.068	.065	.066	.074	.083	.072	.110
	.052	.055		.061	.072		.084	.075	
Mean	.049	.051	.066	.065	.072	.080	.087	.078	.112
C=84	.060	.052	.067	.076	.069	.072	.077	.092	.113
S=10	.066	.053		.073	.068		.078	.094	
K=6	.056	.058	.063	.072	.059	.081	.072	.092	.125
	.066	.063		.064	.062		.076	.095	
Mean	.062	.056	.065	.071	.064	.075	.076	.093	.119

C = Charcoal — S = Salt — K = Kerosene
A = .07 % Carbon — B = 10 % C. — C = 27 % C.

TABLE 1—RESULTS IN FIRST SERIES OF EXPERIMENTS, GIVING DEPTH OF CASE



each grade of steel. After carburizing the specimens were cut in two parts of 3 and 5 inches respectively; the 3-inch pieces were milled so as to leave a central strip $\frac{1}{8}$ inch thick and $\frac{1}{2}$ inch long, as shown by Fig. 4.

The six pieces thus prepared and three of the 5-inch pieces—one for each grade of steel—were placed in a gas furnace—Fig. 3—which had been heated to 1450° F. The charge was heated at 1450° F. until the color of the specimen was the same as that of the pipe containing the fire end of the pyrometer.

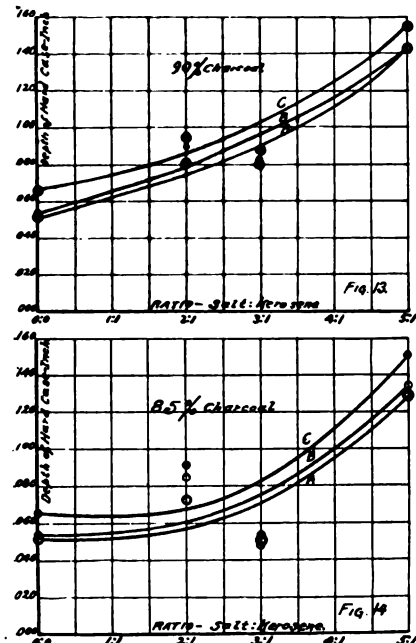
Having reached the temperature of 1450° F., the specimens were plunged one by one into a tank containing clear water at an average temperature of 70° F. The 3-inch pieces were used for determining the depth of the case, three of the 5-inch pieces for fractures and the remaining three 5-inch pieces were kept in reserve to verify a doubtful result obtained with any of the other specimens.

Fig. 4-c-d shows the method of removing the soft core; two cuts were made with the hack-saw and the central portion removed with a chisel. Fig. 4-d shows a test piece on which the soft core is entirely removed, leaving the final, filehard case for measurement. This method of

determining the effective hardness of "the case" is somewhat crude, but really affords a practically accurate method, providing the filing is done judiciously. Three square, second cut, bastard files were used, one of which was kept as sharp as possible for a final test for soft metal. File No. 1 was used until it failed to cut; naturally, the first file became dull within a short time. The second file, being kept in better cutting condition, was tried next, and when the second file ceased to cut, a few light strokes were made with the third file to remove the rest of the soft core. The correctness of this method depends to a large extent upon the skill of the filer.

Table 1 gives the results of the first series of experiments. It will be noted that there are two samples of steel A, B and C, respectively; two diametrically opposite measurements were obtained from each sample of A and B, and one measurement for each sample of C, giving a mean of four measurements for A and B and a mean of two measurements for C.

The depths of the hard case resulting from the various runs, and determined by the method outlined above, are plotted as ordinates and the other variables as abscissæ in Figs. 5-10.



FIGS. 13 AND 14—SHOWING RESULTS IN SECOND SERIES

Referring to Figs. 8-10, it will be observed that an increase of salt and kerosene relative to charcoal produces a deeper case, with the exception of curves C and B in Figs. 9, and A in Fig. 10, where the penetration apparently decreases after a certain amount of salt and kerosene has been added. One might, therefore, infer that while the addition of salt and kerosene aids carburization, there is a certain proportion between the constituents of the packing material which will give the best efficiency; and to determine which ingredient—salt or kerosene—is the more effective, the second series of experiments was undertaken.

In these experiments the time and temperature were kept constant at six hours effective, and 1800° F., the packing mixture being varied according to the following tables:

% Charcoal	95	90	85
100%—% "	5	10	15

Salt %	4½	8½	12½
Kerosene %	½	1½	2½

Ratio 5 to 1.

% Charcoal	95	90	85
100%—% "	5	10	15

Salt %	3¾	7½	11¼
Kerosene %	1¼	2½	3¾

Ratio 3 to 1.

% Charcoal	95	90	85
100%—% "	5	10	15

Salt %	3½	6½	10
Kerosene %	1½	3½	5

Ratio 2 to 1.

% Charcoal	Ratio Salt:Kerosene											
	100% Charcoal 0:0			2:1			3:1			5:1		
	A	B	C	A	B	C	A	B	C	A	B	C
95	.049	.054	.065	.076	.074	.080	.094	.087	.112	.146	.141	.170
	.056	.048		.072	.070		.090	.097		.138	.156	
	.048	.058	.067	.078	.081	.088	.092	.098	.100	.152	.139	.174
	.057	.058		.084	.076		.093	.099		.132	.170	
Mean	.052	.054	.066	.077	.075	.084	.092	.095	.106	.142	.151	.172
90	.049	.054	.065	.077	.097	.095	.084	.086	.090	.144	.140	.150
	.056	.048		.083	.096		.080	.085		.143	.149	
	.048	.058	.067	.077	.082	.096	.077	.087	.086	.145	.140	.160
	.057	.058		.089	.086		.080	.081		.140	.144	
Mean	.052	.054	.066	.081	.090	.095	.080	.082	.088	.143	.143	.155
85	.049	.054	.065	.074	.080	.094	.047	.043	.052	.125	.129	.150
	.056	.048		.084	.085		.050	.044		.127	.132	
	.048	.058	.067	.068	.093	.090	.051	.052	.054	.129	.135	.150
	.057	.058		.066	.082		.054	.054		.138	.139	
Mean	.052	.054	.066	.073	.085	.092	.051	.048	.053	.129	.134	.150

A = .07% Carbon — B = .10% C. — C = .27% C. —

TABLE 2—SHOWING RESULTS IN SECOND SERIES GIVING DEPTH OF FILE-HARD CASE



The object of the above scheme is manifestly to keep the amount of kerosene constant relative to the charcoal and increase the percentage of salt in the ratios 2:1, 3:1, 5:1. Incidentally, the question might be raised why the percentage of salt was increased instead of the kerosene. To make the analysis complete, the kerosene should also be varied in the same ratio as the salt, the latter being kept constant. The writer's opinion, however, is that the increased penetration is due to the salt rather than to

kerosene; and this theory will be considered more fully in the subsequent analysis of the results.

The depth of the file-hard case was determined in exactly the same manner as outlined for the first series; the results are given in Table 2, and plotted in Figs. 11-14, having the depth of the file hard case as ordinates, per cent charcoal and ratio of salt to kerosene as abscissæ.

Analysis of Results

In Figs. 5-7 the relation between depth of case and time is clearly

shown; comparing the increase in depth from four hours to six hours, and from six hours to eight hours, it will be noted that during the latter interval of two hours, the penetration is more rapid than during the interval from four to six hours, as indicated by the rapid rise of the curves. The curves shown in Fig. 5 are, most probably, typical time-penetration curves; that is, they are nearly parallel. There is no logical reason why curves B, Fig. 6, and A, Fig. 7, should be convex upward.

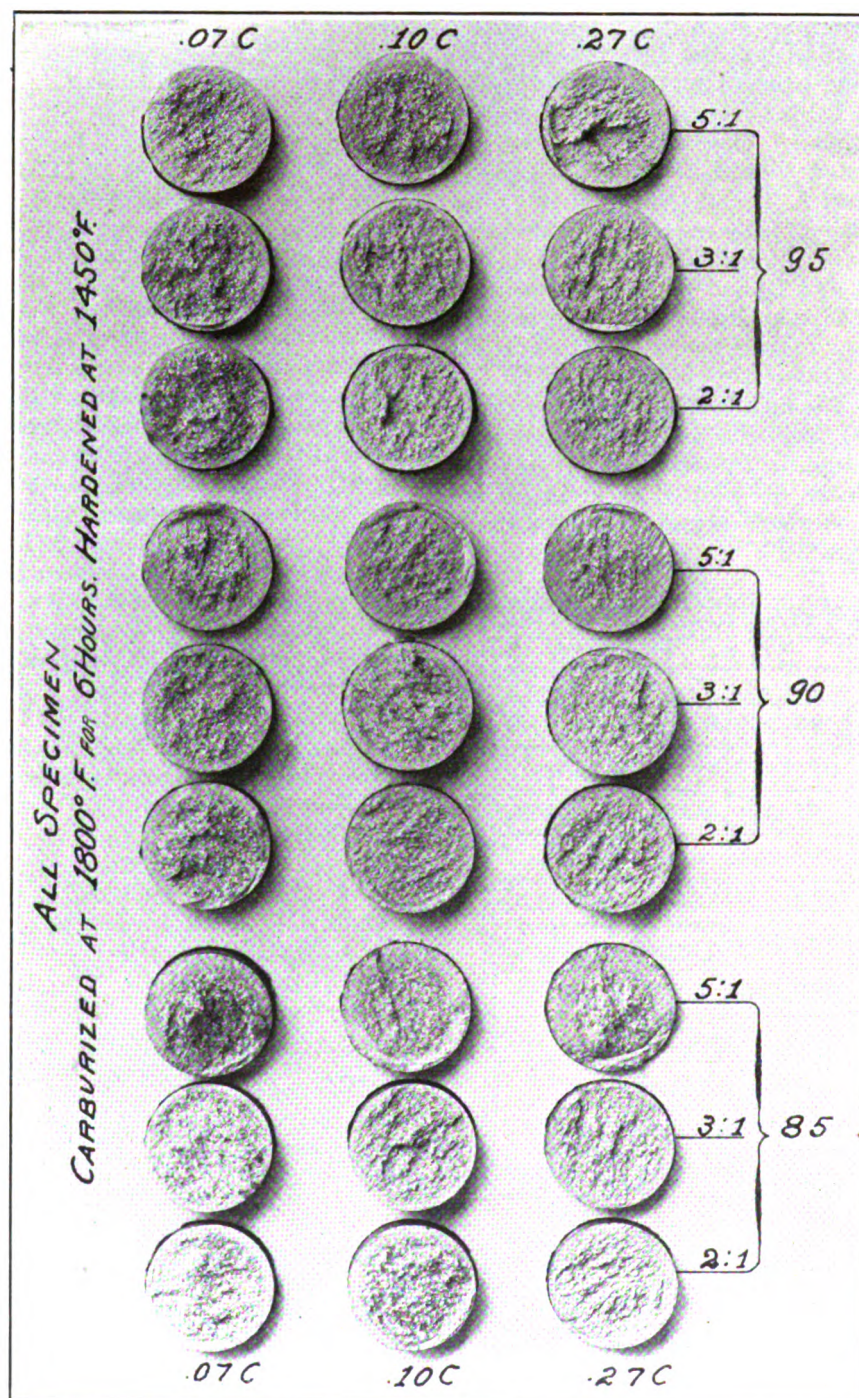
Following the four, six and eight-hour ordinates of Figs. 5, 6 and 7, respectively, the influence of salt and kerosene upon the depth of the case is brought out to some extent; but for a better comparison, the curves in Figs. 8-10 were plotted. Referring to the latter, the increased penetration due to addition of salt and kerosene is quite noticeable. The characteristic of the curves is somewhat irregular; the curves in Fig. 9 probably represent the typical relation between depth of case and percentage of salt and kerosene, i.e., they are nearly parallel and show a tendency to slope downwards after a certain amount of salt and kerosene has been added.

This fact is brought out most strikingly in Fig. 11. The curves show the relation between depth of case and per cent charcoal, when the ratio of salt and kerosene is 2:1, 3:1 and 5:1. The curves show a very rapid increase in penetration when the ratio is 5:1, and the least when it is 2:1. Furthermore, with ratios 5:1 and 3:1, the maximum depth of hard case is obtained with 95% charcoal, while with a ratio of 2:1, the maximum depth is obtained with about 89%, with the exception of curve A, which is a maximum of 92% charcoal. The curves are quite regular, except the last points on the curves representing ratio 3:1 at 85% charcoal; the rather low penetration is contrary to the results and inferences drawn from the preceding experiments.

The curves in Figs. 12-14 are intended to show the relation between depth of case and ratio of salt and kerosene; the deductions from these curves are identical with those obtained from Fig. 11.

Heat Treatment

Upon examining the fractures of the carburized and hardened specimens, a striking dissimilarity in the



THE DEPTH OF CASE OBTAINED WITH THE VARIOUS PROPORTIONS OF CHARCOAL, SALT AND KEROSENE AS INDICATED BY MARGINAL NOTATIONS



structure of the grain—particularly of the core—was observed. Specimen A showed the coarsest and specimen C the finest crystalline structure. The above result would naturally be expected since a high carbon steel will always form a finer grain as compared with a low carbon steel at temperatures below 1600° F.

A coarse crystalline structure constitutes a weakness in the steel, and it is, therefore, advisable to heat-treat the steel before it is placed in service. For case-carbonized steel a single heat treatment is not sufficient for best efficiency, for, during the process of carbonizing, the steel has changed from a homogeneous to a dual form. Now the temperature at which the grain will be refined depends on the carbon content, it being higher for low carbon steel. With this fact in mind, and knowing that the carbon content at the surface is much higher than in the core, a double heat treatment would naturally suggest itself.

To determine the temperature for heat treatment, three samples, A, B and C, were heated to 1450°, 1500°, 1550° and 1600° F. respectively, plunged in water at 70° F. (average) and then broken. To break the specimen, about $\frac{3}{4}$ inch of one end was inserted in a hardened disk having a $\frac{1}{8}$ -inch hole, and mounted horizontally in a heavy cast iron swage block; the blow was struck with a sledge hammer. A temperature of 1600° F. was found to give the best results for the core, but the outside case appeared very coarse. Consequently, the specimens were reheated to 1450° F. and quenched. The fracture obtained after the second heat treatment showed a marked improvement. Not only were the core and case refined, but also that more or less distinct demarcation between case and core disappeared in the majority of the samples, as can readily be observed from the photographic reproductions. It is desirable to have a gradual transition from case to core rather than a sharp division line. Under the latter condition, the case is liable to crack and peel when subjected to transverse stresses.

It must be borne in mind, however, that the above method of heat treatment—applying to these experiments—is not absolutely correct. There were three different grades of steel, and the proper heats should have been determined for each grade; but these

experiments were conducted on a comparative basis and, therefore, all samples had to be subjected to the same treatment.

Conclusions

These experiments were conducted without undue precision or the use of elaborate apparatus in order to conform with the methods and means

carbon content and ascribes the increased rate of penetration to the presence of manganese. Assuming this theory correct, the curves A, B and C, Figs. 5-7, corresponding to .07% C., .46% Mn.; .10% C., .70% Mn. and .27% C., .86% Mn., respectively, are in a logical sequence, with the exception of A in Fig. 7.



THE BUSY SHOP OF MR. J. J. MORRISON, IN PENNSYLVANIA

of the average commercial case-hardening plant; in fact, some slight improvements could have been made which would have placed the process under better control. For instance, the method of sealing the crucible is not satisfactory; the fire clay, when heated to a high temperature, is liable to crack and work loose from the cover joint, thus permitting the carburizing gas to escape. This defect is, most probably, the source of the discrepancies which can be observed between some of the results. A second pyrometer could be used to good advantage for the purpose of checking, and more definite information as to what is going on inside the crucible. The fire end of the second pyrometer should be located in the center of the crucible so that data could be obtained in regard to the thermal conductivity of the carburizing material.

Referring again to Figs. 5-7, a predominating increase in depth of case can be seen with an increase of carbon content in the steel. Whether this increased penetration is due to the higher per cent carbon has been a subject of controversy among various case-carbonizing experimenters. The present theory maintains that the penetration is independent of the

The function of the salt and the kerosene, so far as determined in these experiments, is to maintain the surface of the steel in a receptive condition for the carburizing gas. It is possible that the kerosene, being composed of hydro-carbons, does supply carbon; but an increasing amount of kerosene in the packing mixture seems to impede carburization rather than aid it. The salt is, in all probability, the important ingredient, this statement being based on the following observations. When the steel was packed in pure charcoal, the surface became covered with a uniform film of oxide during the carburizing process. Upon the addition of salt and kerosene—especially with 92% charcoal in the first series of experiments—the oxidation was noticeable on isolated portions only, the rest of the surface being clean and of a dull grey color, producing a decidedly mottled effect. Further increase of salt and kerosene with 84% charcoal, the surface was covered with irregular dark spots, many of which had a gummy appearance.

The influence of salt is brought out more conclusively in the second series of experiments. With the 5:1 ratio and 95% charcoal, the surface of the steel remained entirely clear and of a



uniform dull grey color. With the same ratio of salt to kerosene, but 90 and 85% charcoal, respectively, the surfaces became covered with a light oxide on isolated portions, the remainder being of a greyish color. Referring to Fig. 11, ratio 5:1, it can be seen that the deepest penetration is obtained with 95% charcoal, corresponding to the packing which produced entirely clear surfaces on the steel. The tendency of staining the surfaces increased with decreasing percentage of charcoal and decreasing ratio of salt to kerosene.

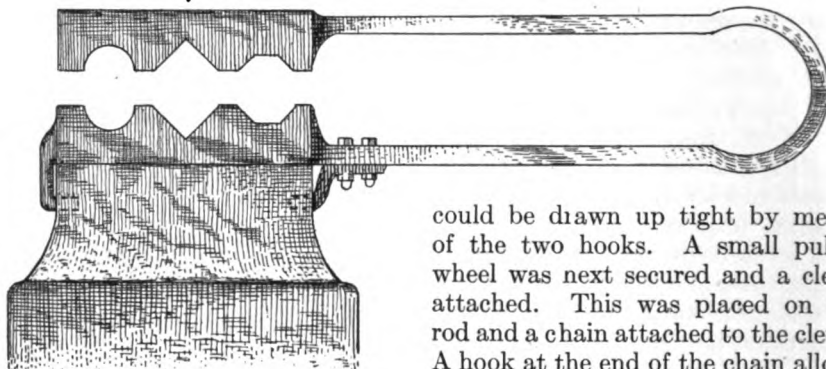
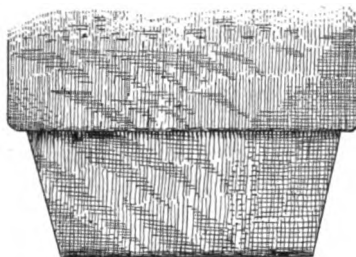
The above observations lead to the following conclusions: With pure charcoal there is a sufficient amount of air entrained in the packing to permit the formation of an oxide which impedes carburization. The salt neutralizes that effect by volatilizing and forming a sort of flux on the surface of the steel which protects the latter against oxidation. The percentage of charcoal and ratio of salt to kerosene should be high for best efficiency; about 95% of charcoal and a 5:1 ratio of salt to kerosene gives the best result according to this investigation.



Self-Supporting Spring Swedges

BERT HILLYER

In shops where there are steam or power hammers, spring swedges are used to shape and form many forgings. These require an extra man to hold them onto the hammer die, and also add extra expense in making the forging which will be more noticeable when numerous pieces of the same pattern are to be turned out.



A SELF-SUPPORTING SPRING SWEDGE

A swedge made like the one shown in the accompanying engraving will please the man who has to work short-handed, and will also increase the profits of the shop owner. I don't think this device requires much explanation: A one-inch hole is drilled in each end of the hammer die. The bottom part of swedge is made with a round stem bent over so as to fit into the hole, and a bracket with two bolts holds the other end securely. The holes in bracket should be made to pull swedge tight to the die block.

The swedge shown in sketch was made to shape hexagon and square headed bolts, and makes each one the same size.

A Handy Helper for the Smith Who Works Alone

M. T. SWEENEY

In handling long pieces the smith often works under difficulties. Some use boxes, kegs and all manner of things to support the long articles while working on them, only to have the support topple over just at the critical period.

To support articles and work of this kind I arranged a handy device as shown in the engraving. This

simple arrangement consists of two old tie rods welded together. These rods were taken from an old warehouse when it was dismantled, the rods welded together, two hooks formed to fit the eyes in either end and then the rod was suspended as shown. In welding the rods they were measured so that the finished rod

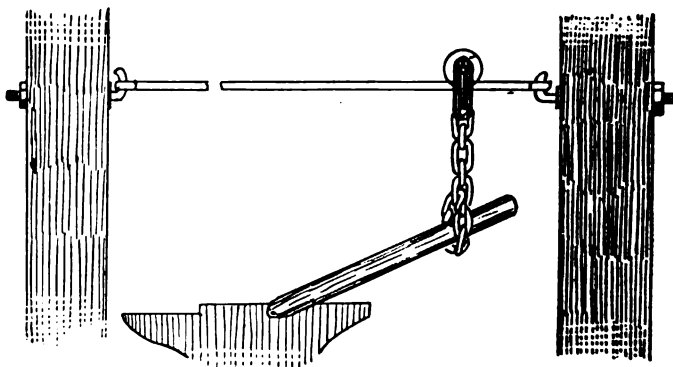
could be drawn up tight by means of the two hooks. A small pulley wheel was next secured and a clevis attached. This was placed on the rod and a chain attached to the clevis. A hook at the end of the chain allows for making a loop in the chain so as to hold up articles of practically any size and at any height.

If no rods are to be had for this device a piece of cable or a stout wire would serve the same purpose.

On Cracked Chisels

H. N. POPE

I find in our April number two answers to the cracked chisel question. I do not agree with either, as I believe the mischief is done on the anvil; too hard blows are used in drawing the tool out. Some smiths say a chisel must never be drawn on edge. Now, I do not think it harms the tool if judgment is used. I always draw on both flat and edge; of course, finish on flat, and finish quite cold with very light blows. Now as to tempering, be sure and do not get too hot; for a tool that has been overheated should be rehammered to close up the steel, as no amount of drawing the temper will relieve the strain. It is well, if one does not know what a piece of steel will do, to cool at

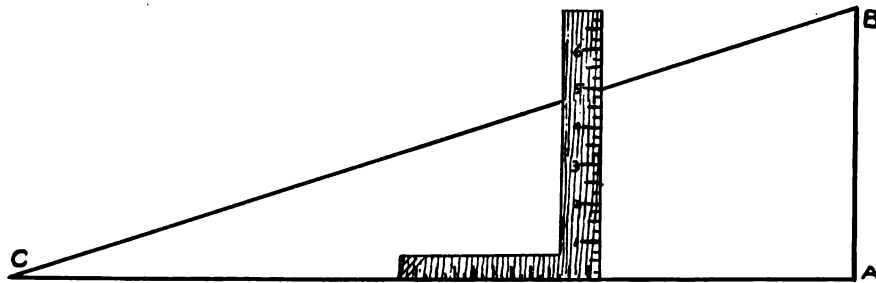


A HANDY HELPER FOR THE LONE SMITH



different heats; then use a file and one can soon tell at what heat to cool. One grade of steel will harden at a

C to where the line C-A crosses the steel square. With this figure as a starting point we multiply by 5 and



MEASURING STOCK FOR BANDS IS EASY WITH THIS DIAGRAM

very low heat, while another grade requires more heat. Get a good article and stick to it, and you will always know what to expect from it.

There are a few "Don'ts" it is well to remember when working steel. Don't heat too hot, *at any time*. Don't draw all on the flat with heavy blows, as it will pull the center out faster than the sides, leaving a strain which causes the circular cracks. Don't heat hot enough to scale for tempering.

Measuring Stock for Bands

R. C. HORSFALL

I believe it is Brother Gleason of South Dakota who uses leather same thickness as the stock he is about to use, but I would advise all brothers to make a sketch of my idea, and hang it on the wall close to the forge or anvil.

Make a diagram similar to the engraving. The line A to B is seven inches. The line from B to C is 22 inches long, exactly. Now suppose you need a band 5 inches in diameter. Take the steel square and place it on the diagram as shown—the distance from the 5-inch marks on the square to the point at C is the circumference of the stock you require. You must not forget to add twice the thickness of stock you are about to use. For instance, if the wagon wheel was 4 feet 11 inches and the tire was $\frac{1}{2}$ inch thick, that would make it 5 feet over all circumference. To get a large size it is necessary to multiply, and I am sure any smith can do a bit of multiplication in this instance.

For example: suppose a hoop is to be made $2\frac{1}{2}$ feet in diameter. $2\frac{1}{2}$ feet equals 30 inches and as 5 times 6 equals 30, we measure 6 inches on the steel square, then the distance from

add to the resulting figure twice the thickness of the stock to be used.

The Blacksmith Class at Phoenix Indian School

J. F. STALLARD

I am sending you a picture of my class of boys and myself, taken at the Phoenix Indian School.

I have a class of fourteen boys—seven work in the morning and seven in the afternoon. They attend school one half day and work one half day. They get all kinds of repair work to do, as we have between thirty and forty horses and mules to keep shod and all kind of farm tools to keep in repair. They make the wagons and spring wagons by hand, and a great many other tools.

The picture shows a wagon with four-inch tires just completed. Even the iron on the wagon, with the exception of the skeins and boxes, was made by hand.

Every one of the boys reads *THE AMERICAN BLACKSMITH* and takes a great interest in it.

In conclusion I wish to extend a cordial invitation to the readers of *THE AMERICAN BLACKSMITH* who should ever happen to come to Phoenix, Ariz., to visit our school and shop.

A Visit to Tom Tardy's Shop

M. A. FOSTER

I greeted Tom with a hearty "Good morning" as I walked into his shop, but all he said was "Pretty good."

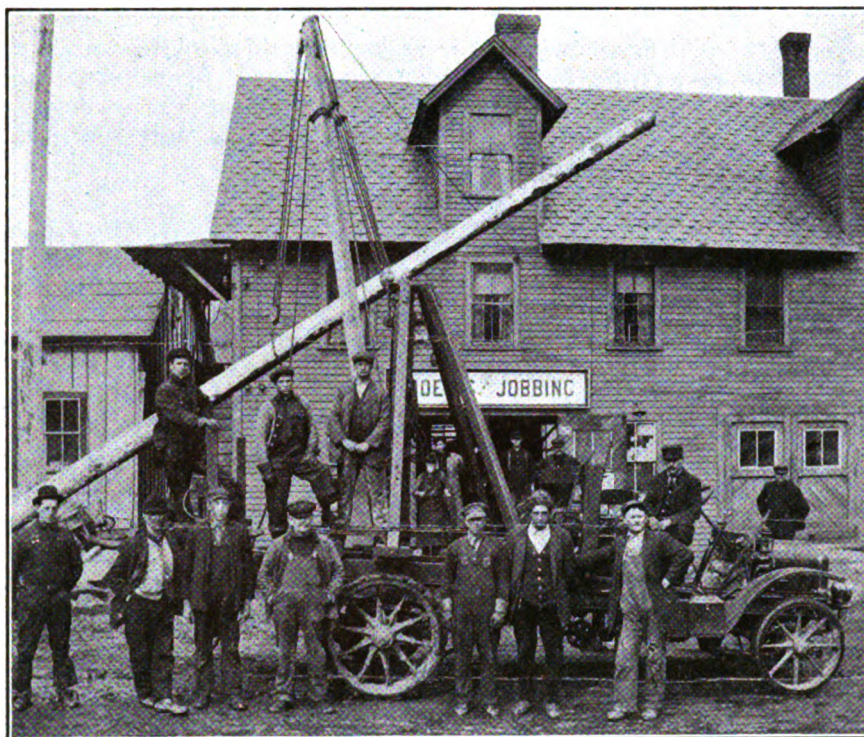
Tom was sitting on an old tressel bench which had but three legs. He was smoking a cob pipe and wore a Mexican summer hat that has seen more service than the tressel bench. I asked "How's business?" "Purty good, sometimes," was the reply. I said, "You don't do a very extensive line of business here, do you?" "Oh yes," said Tom. "Some days we have fits, we're so busy; you see, some o' these fellows come through here purty badly crippled, and if we didn't help 'em they could never get out o' here."

I was much interested in viewing the tools in Tom's shop. He had an old bellows which he had made himself, and his material consisted of a few pieces of scrap lumber and some green hides. The bellows was built just about square, and I believe that it occupied about a third of the floor space.

The anvil was a cast-iron weight that formerly had been used as a weight for a safety valve on a large boiler. The next thing that caught my eye was a drill press. It consisted of a heavy brace with the head off. An 8-foot pole with a hole bored about 3 feet from the heavy end to



THE BLACKSMITH CLASS AT THE PHOENIX INDIAN SCHOOL, ARIZONA



REX BROTHERS GENERAL SMITH SHOP OF MASSACHUSETTS—MOTOR POLE SETTER BEFORE SHOP

place the end of the brace in was used as a lever feed. When Tom wanted to drill a hole in anything he would fit that brace with some kind of a bit and lay his work on the bench. Then he put the large end of the pole in a hole in the side wall of the shop, inserted the upper end of the brace into the hole in the pole and turned the brace with one hand and pulled down on the pole with the other.

Well, these were the principal tools, and they are a fair sample of the rest. I asked Tom if he wanted to sell out. Tom said, "Nope." I asked why and he said, "I'm a hundred miles from the railroad, and nobody comes out this far, only Mexicans and Indians who live around here. There ain't a blacksmith in this whole d— country except myself, an' so, naturally, I ain't got no competition, and I do all the work."

Tom's appearance was as odd as his shop and equipment. His whiskers were about fourteen inches long and his hair was not far behind that. He wore a pair of overalls which apparently had been blue in days gone by. One of the shoes that he wore had no doubt been of U. S. Government issue at one time, while the other shoe was of Mexican descent. I don't just remember about the shirt, but he wore something of the kind. I am enclosing a picture of Tom's shop.

The picture does the shop a little more than justice as I saw it.

A General Shop and a Motor Pole Setter

REX BROTHERS

We are sending you, herewith, photograph of our shop which is 26 by 50 feet with two tenements upstairs. On the left of the picture is shown a corner of our garage which is 46 by 32 feet with basement.

We shoe horses, repair wagons, sleds and autos, and occasionally sell an auto. We have had two helpers this winter. The man standing in door on right is L. M. Rex, with helpers on right. On the left is J. O. Rex. The auto truck shown in picture is owned by the Greenfield Electric Light & Power Company. The man at the steering wheel is the son of a blacksmith and the inventor of this derrick arrangement for setting electric light poles. It is operated by a friction pulley on motor flywheel. With the aid of this derrick, two men can set ninety poles in nine hours. The boss of this crew is the son of a Vermont blacksmith—he is standing on ground at right. On the right near front of auto is the auto expert of this vicinity.

Our prices are very good. We get \$1.50 for new shoes and \$.75 each

for ordinary bar shoes; N. S. shoes, \$2.50, and \$3.00 per set; wagon work about the same as in other places.

A Helpful Letter from Illinois

WM. MORRISON

I am located in an inland town about 1½ miles from the railroad, but a nice, quiet little town. I have been here only two years, but am surprised at the trade I am building up. I would like to see more in regard to the uniformity of prices and the credit system. If all smiths would resort to the cash system it would be much better for themselves. We could then pay cash for our material and save on our purchases, and also save the postage for sending out bills. As for myself, I am going to do business on a cash basis in the future. Of course I expect to lose some of my customers, but better to lose a few customers than several dollars' worth of material and hard work. With our goods on the rack we can get money for them at any time; but out on Mr. "Slow-Pay's" wagon we can get nothing.

In answer to Mr. J. E. Mayhue of Oklahoma, regarding plowshares, here is the method I use: I heat my shares about an inch back from the edge (not over that), or just enough to get a good draw. If I think one is liable to back up, I use a clamp and lap lengthwise on anvil, but never strike farther back than I want to draw. I think if Brother Mayhue will follow these directions he will have no trouble with his plow shares backing, providing, of course, he does not lay the share flat on the fire.

A spring "kink" which may be new to some, and perhaps some will say "bosh", but I have been so successful with this method that I have a great deal of confidence in it. After I have finished a spring to go in its place I have never had one break or work out.

I finish the spring to shape, then heat to a good red and drop into linseed oil and allow to remain there until perfectly cold. Then remove and hold over flame until oil burns off; lay down and allow to cool, and you have a spring you can twist if it has been worked right and worked at the proper heat.



A Vehicle Shop of New South Wales

JAMES R. SMITH

The accompanying engraving shows my shops and also the working force. I receive my journal regularly, for which I thank you, and find it very interesting and helpful. Mr. Bagot of this town has no end of praise for the paper, and he is not in our line of business, either. He is the proprietor of a saw mill.

There is very keen competition here in the horseshoeing line; four shops shoeing for 4s. (\$.97) per set hack, but three out of the four have been obliged to close up shop. My price has been 5s. (\$1.22) all along, although it has hit me hard, working against cheap men.

You will notice the small hand-cart in the photograph which I use to meet the river boats for light work. The next is a coach under repairs; the third a rubber-tired sulky with timber axle and pigamoid tramways. Next are two sulkys to repair, then a top dray, then a spring van made for Bagot Bros.' saw mill, which is used for town delivery. I have a working force of six men whom I will describe, starting from the left of picture: The first man is an apprentice of three years at the trade, and doing my coach work; he is an excellent workman. Next is another apprentice of six months, holding the horse; next comes your humble servant, in the blue shirt and cap, and following on is my floorman. My eldest son

is standing at the paint shop door; he does all the painting and is very clever at it, he is only seventeen years old. Standing at the corner of the paint shop with his arms folded is my wheelwright who has been with me ever since I started. The other gentlemen are bystanders. I run two fires, doing all the shoeing myself with the assistance of the floorman.

The Novel Advertisement of a New Zealand Smithy

The advertisement reprinted below was recently used by Mr. George Dash, who runs Dash's Carriage Works in New Zealand. Mr. Dash has sent us several novel things in the advertising line from time to time and this latest "stunt" is fully up to his standard:

Five Miles of Horse Nails—Twenty Thousand Shoes

"Dear me, I didn't know you shod horses here," is even yet an exclamation heard from some belated client, although we have been shoeing for several years and yesterday nailed on the twenty thousandth shoe. We have presented our head shoeing smith with a suitably inscribed gold charm for his watch chain to celebrate the event.

The horses wearing those shoes have carried from our premises upon their feet twelve and a half tons of metal and the nails used to attach those shoes would, if put end to end, stretch for five miles. Those one hundred and sixty thousand nails alone weighed twelve hundred pounds.

Placed head to tail the horses wearing those 20,000 shoes would form a line of horses eight and a half miles long. The metal borne by their feet if reduced to say ten gauge fencing wire would suffice to put a five wire fence around a paddock of one

thousand six hundred and sixty acres, providing paddocking for the five thousand mob at about three horses to the acre. Included in the lot was a diminutive pony we could carry out of the shop and a giant Clydesdale measuring seven feet six inches round his girth and carrying a six-foot bar of iron on his feet..

Yes, we shoe horses here—all sorts—and lots of them.



"And a Washing Machine"

By the Editor

Sometimes a very short sentence will preach a stronger sermon, tell a greater story or point a stronger moral than a five-foot shelf of books.

A recent letter from an Ohio reader contained four words that warmed the cockles of our heart and brought a smile of quiet contentment to our sour visage despite the high cost of living and gasoline.

The writer of the letter described his smith shop equipment and sent us a picture of his shop and home. He told about his gas engine, his drill press, emery stand and his saws and then said: "And, last but by no means least, a washing machine for the women folks."

"And a washing machine"—those four words tell the story. This smith does not consider himself above helping "the women folks" and making their burden lighter. The gas engine makes the smithing work easier—machines make drilling, grinding, and sawing easier—why not a machine to help "the women folks"? Why not have the gas engine help them too?

Yes, and this same smith not only helps "the women folks" by hitching up his gas engine to the washing machine on wash-day but a swing occupies the front yard of that smith's home. There isn't a "Keep off the grass" sign there, but a swing. One of these safe, sensible swings in which a flock of little girls or a gang of little boys will have a real good time playing everything from "boat" to "school," and—that swing is under a nice big shady tree.

That swing tells another story. And that "washing machine for the women folks," and that swing for the little tots tell the story of the man who is spending some of this world's goods to make the burden of "the women folks" lighter and the life of the children brighter. Seems to me a chap like that ought to be filling his little niche in this world in pretty good shape. What say you?



THIS GENERAL SHOP OF NEW SOUTH WALES IS RUN BY MR. J. R. SMITH



Jack Smith, My Fellow Fine, Can You Shoe This Pair of Mine?

W. O. B.

Shoe your neat pair? Ah! little sprite,
If you but knew how well I might,
How glad I'd be to shoe your pair,
To shoe and lavish every care
Upon a dimpled pair so fine—
Ah me, how I do wish them mine—
To shoe, aye, clothe from top to toe
And on them every care bestow.

If wishes were horseshoes, little elf,
I'd forge a shoe and wish myself
Your pair of prancers, your harnessed team
Your span from fairyland or dream.
I'd forge a mammoth wishing shoe
If I'd but gain such elves in blue.
And I would care but naught for more
Than on them every care to pour.

Shoe your pair of fairies there?
Ah! little elf, if I but dare—
If I but had your dreamland span
To warm a heart and cheer a man
Who's sometimes sorrowful, sometimes sad
Because he has no girl or lad
To shoe and harness—to trim so fine—
I wish that pair of yours was mine.



Remember your neighbor's conditions are not necessarily yours when you are figuring on copying something your neighbor is doing.

Farmers will put away a big, fat roll of money this season—better get your bills to them before they put the money where you cannot get at it. Do it now.

Cuff Brasher says: "I most allus agree with what the Good Book ses, but I notice thet most o' the successful smithing shops is built on sand, grit an' gumption."

Don't think you can do perfect work on a poor, imperfectly balanced emery wheel and stand. Fix the stand rigidly and then see that the wheel is held tightly in the stand.

When you renew your subscription, remember Our Long-Time Rates. Even a two-year subscription will save you forty cents; and that is certainly worth saving these days.

And now we close Volume XII. What have you to say about this issue and the first copy you read? How do you think this paper compares with the others that have appeared?

How's your herd of pink buffaloes? We've got another lot on hand—better ask for some if your supply is low. Don't ever let your stamps get so low that you are in danger of being entirely out. A postal will do.

Ever hear of a good business man "talking politics" during business hours? Don't do it—misunderstandings and disputes result and nothing good is accomplished. "Keep a-hammerin'" is the best smith slogan we know.

It's pretty hard sometimes to get a man's business, and sometimes still harder to get your pay. Make a careful study of both ends of your business. Success at both means business success—success in but one means failure.

The old Caylloma silver mines, which were worked by the Spaniards in the 16th century and were probably well known to the Incas centuries ago, are now being operated by a modern hydro-electric plant. This plant is located at an elevation of 15,000 feet.

Two blacksmiths from Venice are making a unique journey around the world. In June, 1910, they started from Venice, Italy, and will attempt to travel around the world in a barrel of special construction. They estimate that the trip will take them at least twelve years, so they still have nine years of barrel rolling to do.

Litchfield, Neb., has a population of about five hundred inhabitants and is situated on the main line of the B. & M. Ry. There are two blacksmith shops and 'most anything except an automobile repairer and a wagon-maker and, of course, we are obliged to do that work. I think if we had a good wagon-maker and a good automobile repairer it would help the town and also the blacksmiths here.

K. H. LADEGARD.

Speaking of opportunities in the automobile field, do you know that one Detroit firm builds more automobiles than all the other makers combined? This one shop handles a million pounds of material a day and uses a million lamps, eight hundred thousand wheels and tires and ninety thousand tons of steel each year. The regular schedule calls for 800 completed cars a day, but they have turned out more than 1,300, and make 900 regularly during the busy season. No opportunities, did you say?

Now is the time to get busy on your farmer accounts. For—

When the fodder's in the silo,
And the oats are in the bin;
When the farmer sits and chuckles
As he sees the corn roll in,
Then it's time to dust the ledger,
Figure up his whole account;
Hit him quick while he is laughing
And he'll pay the full amount.

Play Ball!

W. O. B.

Life is like the National Game

Where every "run's" worth while,
Where every player comes "to bat"
With a confident, cheerful smile.
Sometimes you "fan" or "take your base",
Sometimes you "smite the bun"
And 'mid a howl from bench and stand
You make the winning run.

Sometimes you're not in "proper form",
And "errors" are your due;
With just a row of "goose-eggs"
For your "fanning pirate crew".
You simply cannot "find the ball,"
You cannot "get the hang"
Of what the "slab is serving up"—
You're "not there with the bang".

Again, you play just like a "champ"—
"No bush league now" you say.
"I've got the Indian Sign on Chance,
"Et al—now comes my day.
"The Georgia Peach has naught on me
"I am the big league smoke."
But—one day some "bush league recruit"
Just shows you up—"a joke".

But never mind your "playing form"—
When you've packed your bat away,
I hope the boys you played against
Will with goodly reason say:
"He played clean ball—was on the square,
"A sport he was, by test,
"And no matter where he ever played
"He always did his best."

"Isn't that a pretty poor price to get for shoeing?" we questioned as Tom pocketed the forty cents he asked of his recent customer. "Yes," returned Tom, "but then it's a pretty poor job." And we hadn't the heart to deny it.

The smith who realizes that he can cure just about ninety-nine per cent of his business troubles by backing up his work with real brains is the one who is making pretty good time on the road to success.

Like walking gloom factories do some men appear with their many wornout troubles. Forget it and smile. In God's good green earth there is nothing half so healing for body, brain and heart as a good, big, broad, continuous smile. Just smile and forget it. The sour visage never helped anyone.

You can't take care of any added fall trade unless you prepare for it. None too early now to get tools, machines and equipment in shape for a little increased activity. And don't forget to have the stock in stock—you'll need stuff quick when you need it.

A recent item in a Kansas paper reads as follows:

Engine Blows Up

The gasoline engine owned by Will Duncan, being used to furnish power for the rock crusher at the Warren farm just east of Lyndon was rendered useless on Friday by an explosion induced by a lack of water. No one was hurt. The fire box and crown sheet were crumbled up like paper and the boiler iron was crystallized making those parts poor junk.

Great blue rings of exhaust smoke, did anyone ever hear of such reporting? Probably the only reason this "explosion and great fatality" didn't result in "twoscore of dead and maimed" is that the gasoline engine never had a "crown sheet and fire box" to "crumble like paper." Wouldn't it soot your carburetor?



Our Honor Roll

If Your Subscription Expires This Month

A ten-year renewal will put your name right up amongst the leaders. Just consider this, please: The saving you make when you subscribe for a ten-year period. And then the time, trouble and annoyance—and last but by no means least is the continual increase in the value, the importance, the quality of the paper itself.

Just read the rates carefully. The table tells you just exactly what you pay, what you save and what you get. There are no juggling of figures—no hard-to-understand combinations. And every saving you make is a real one.

U. S. and Mexico	Canada	Other Countries
2 yrs. \$1.60 save \$.40	2.00 save \$.50	10 sh. save 2 sh.
3 yrs. 2.00 save 1.00	2.70 save 1.05	14 sh. save 4 sh.
4 yrs. 2.50 save 1.50	3.20 save 1.80	18 sh. save 6 sh.
5 yrs. 3.00 save 2.00	3.75 save 2.50	1 £ save 10 sh.
10 yrs. 5.00 save 5.00	7.00 save 5.50	1 £ 14 sh. save 1 £ 6 sh.

Send your order and remittance now—today. Don't wait until you forget all about it. You'll never regret it. Our subscription insurance saves you money. The sooner you begin saving the more you save. There is no time better than NOW.

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J. BAILEY, Man.	Dec., 1923	C. R. OLIVER, S. Africa	July, 1918
W. R. TURNER, Man.	Oct., 1923	L. G. REID, S. Africa	July, 1918
W. W. GREGG, Tex.	July, 1923	WRIGHT & SON, Tex.	June, 1918
OTTO SIPPPL, Penn.	June, 1923	ALBERT MELLUM, N. D.	June, 1918
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F. H. SHUPP, Penn.	June, 1923	W. W. BRIDGES, Ark.	June, 1918
J. C. STOVER, Penn.	Apr., 1923	ED. HOLLAND, Queens	May, 1918
W. SCHOONOVER, Pa.	Apr., 1923	H. L. HASWELL, N. C.	May, 1918
LOWNSDALE BROS., Mo.	Mar., 1923	H. S. YONGUE, Wash.	Apr., 1918
J. CARRSWELL, Ark.	Mar., 1923	W. WELLSHAUSEN, N. D.	Apr., 1918
G. E. GLAZIER, Ohio	Mar., 1923	W. H. CHIPMAN, Mo.	Apr., 1918
T. BRADLEY, N. S. Wales	Mar., 1923	A. P. STROBEL, N. Y.	Apr., 1918
I. T. NEEDHAM, Ill.	Feb., 1923	E. H. ALBERTY, Penn.	Apr., 1918
G. C. DISINGER, Miss.	Feb., 1923	J. R. JEFFRIES, Pa.	Apr., 1918
J. HUGHES, Ohio	Feb., 1923	R. COLVIN, Ind.	Apr., 1918
J. WIEBER, Minn.	Jan., 1923	J. B. JEFFRIES, Pa.	Apr., 1918
Z. A. ENOS, Kan.	Jan., 1923	J. LIPPERT, Ill.	Apr., 1918
W. G. WISE, Cal.	Jan., 1923	OTTO TIEFT, S. Africa	Apr., 1918
F. S. BISHOP, S. Africa	Jan., 1923	H. J. FISHER, Mich.	Mar., 1918
S. P. FISHER, Mont.	Dec., 1922	GEO. SMITH, N. Z.	Mar., 1918
W. BRECKNER, Okla.	Dec., 1922	AVG. HOLNAGEL, Ore.	Mar., 1918
J. PABIAN, Neb.	Dec., 1922	A. E. UHRLING, Wis.	Mar., 1918
P. FREDERICKSEN, Iowa	Nov., 1922	P. J. THORNTON, N.W.T.	Mar., 1918
L. O. LEITER, Ill.	Nov., 1922	J. C. YOUNG, Pa.	Mar., 1918
W. LAWSON, N. Z.	Nov., 1922	D. C. HOUCK, Ohio	Mar., 1918
W. H. MILLER, Iowa	Oct., 1922	J. MOLLITOR, Ill.	Feb., 1918
A. O. MARTIN, Idaho	Sept., 1922	F. P. FELLOWS, N. Y.	Feb., 1918
O. A. MORTIMORE, Idaho	Sept., 1922	J. W. STRADMAN, Ohio	Feb., 1918
H. J. WYATT, Wash.	Sept., 1922	J. P. HOLAPPEL, Penn.	Feb., 1918
J. N. SKOW, Ia.	Sept., 1922	E. N. GATES, Vic., Aus.	Feb., 1918
A. D. STANDFORD, Wash.	Sept., 1922	RENTON WAGON Wks., Wash.	Feb., 1918
T. TEMKIEWICZ, Que.	Sept., 1922	WHITING Fdy. Equip. Co. Ill.	Feb., 1918
A. PFUEFER, Ohio	Aug., 1922	J. P. KOENIGS, S. Dak.	Feb., 1918
W. D. VALENTINE, Iowa	Aug., 1922	RICHARD BRENNER, Tex.	Feb., 1918
G. HOFFMAN, N. Y.	July, 1922	W. F. HILL, N. C.	Feb., 1918
J. EMMAN, Ark.	July, 1922	J. B. BETTEL, Me.	Jan., 1918
W. K. W. HANSEN, Pa.	June, 1922	W. MISCABLE, Queen, Aus.	Jan., 1918
ROBERT TOCHTER, Cal.	June, 1922	S. PORTELANGE, Que.	Jan., 1918
J. VAN MARTER, N. Y.	June, 1922	D. C. FOLEY, Cal.	Jan., 1918
E. ANDRES & SON, S. Aus.	May, 1922	GLEASON BROS., La.	Jan., 1918
LOUISA CARRIAGE Wks., Va.	May, 1922	C. E. KRUG, Wis.	Jan., 1918
S. SMITH, Tex.	Apr., 1922	G. E. WOODARD, Kan.	Jan., 1918
J. W. HAAR, Ia.	Mar., 1922	P. J. DALLY, W. Aus.	Jan., 1918
E. A. DILLON, Nev.	Mar., 1922	J. MORROW, Pa.	Dec., 1917
D. W. SMITH, R. I.	Mar., 1922	F. PROCTOR, Tas.	Dec., 1917
D. F. KUSTER, Wash.	Mar., 1922	J. G. JOHNSON, Ill.	Dec., 1917
G. F. JOHNSON, Mich.	Feb., 1922	F. E. EGGERS, Ohio	Dec., 1917
R. H. KEITH, Ia.	Jan., 1922	C. T. FORREST, Cal.	Dec., 1917
O. M. JOHNSON, Minn.	Oct., 1921	THEO. BUSH, N. Y.	Dec., 1917
H. FELDUS, Neb.	Sept., 1921	J. T. ELLIOTT, Ill.	Dec., 1917
W. K. KLINE, Kan.	May, 1921	J. VOELPEL, Ill.	Dec., 1917
J. L. JESTER, Mo.	Jan., 1921	W. J. MAIN, Cal.	Dec., 1917
R. S. CRISLER, Ky.	Jan., 1920	G. J. SAUER, Mo.	Dec., 1917
ED. GRIMM, Tex.	Mar., 1920	MESS BROS., Viet.	Dec., 1917
T. P. CONSIDINE, Mass.	Dec., 1920	E. BLOOMER, Aus.	Dec., 1917
J. NAIMSMITH, N. Zealand	Nov., 1919	H. P. ADAMSON, N. Zealand	Dec., 1917
THEO. PASCHKE, Neb.	Apr., 1919	F. R. TOMLINSON, Kan.	Nov., 1917
I. M. TOWNSEND, Cal.	Apr., 1919	KATE & AINLEY, Eng.	Nov., 1917
G. BISH, Fiji Islands	Apr., 1919	T. H. ZIEGLER, Wis.	Nov., 1917
C. WILLIAMS, W. Aus.	Mar., 1919	SCHOLLER BROS., Ind.	Nov., 1917
R. TAYLOR, N. Z.	Feb., 1919	E. M. WURSTER, Mich.	Nov., 1917
ROBERT COOK, Ky.	Sept., 1918	S. Z. FREY, Ind.	Nov., 1917
A. B. WENDLANDT, Wash.	Sept., 1918	B. A. STRENKE, Ohio	Nov., 1917
A. J. BROOKMAN & Co., Vic.	Sept., 1918		
PETER COCKS, W. Aus.	Sept., 1918		

NAME	Subscription Paid to	NAME	Subscription Paid to
J. N. BATHGATE, N. Dak.	Nov., 1917	C. J. HALL, Wash.	Dec., 1916
W. H. HOUGHTON, Pa.	Nov., 1917	BOB FRICKS, Ala.	Dec., 1916
W. T. CUTKOMP, Iowa	Oct., 1917	JOHNS BROS., Tex.	Dec., 1916
J. DELAUS, Neb.	Oct., 1917	R. CLEMENS, Conn.	Dec., 1916
GEO. POTSCHEK, Mo.	Oct., 1917	SCHIFFLEY & SCHMITT, Pa.	Dec., 1916
J. W. RAPS, N. Y.	Oct., 1917	A. BRAUBE, Ohio	Dec., 1916
W. C. RONEY, Pa.	Oct., 1917	J. E. BEATTY, Mo.	Dec., 1916
J. N. MILLS, Ky.	Oct., 1917	GEO. CASSIE, Scotland	Dec., 1916
W. A. WILSON, N. Z.	Sept., 1917	JOHN KAIN, Ky.	Dec., 1916
R. ROSA, N. S. Wales	Sept., 1917	F. W. HOWELL, Ill.	Dec., 1916
I. E. SPROUD, Me.	Sept., 1917	H. A. CREEVER, N. H.	Dec., 1916
FRED. BLOHM, Tex.	Sept., 1917	J. ROBERTSON & SON, Scot.	Dec., 1916
GEO. B. HATON, N. J.	Aug., 1917	W. M. GRIFFITHS, Aus.	Nov., 1916
CLARK & FAUBERT, Queens	Aug., 1917	W. B. TAYLOR & SON, Mo.	Nov., 1916
C. L. HOCKETT, Cal.	Aug., 1917	G. WHITTEN, Mass.	Nov., 1916
H. C. STERNEL, Tex.	Aug., 1917	J. M. VINCENDA, Wis.	Nov., 1916
M. DEJAGER, S. Africa	Aug., 1917	TOM NOLAN, S. Aus.	Nov., 1916
F. HOWARD, Kan.	Aug., 1917	H. J. FRENCH, N. Z.	Nov., 1916
H. FERREL, Ill.	Aug., 1917	F. N. BROWNING & SON, Ky.	Nov., 1916
J. MCMEIKEN, N. Z.	Aug., 1917	P. MACUAB, Scotland	Nov., 1916
F. H. GIERKE, S. Aus.	Aug., 1917	P. GESSER, Ill.	Nov., 1916
A. L. PITTINGER, Ill.	Aug., 1917	J. W. GRIBBLE, S. Aus.	Nov., 1916
F. G. STONE, S. Africa	July, 1917	W. G. SIM, N. Z.	Nov., 1916
V. J. DEVONSHIRE, N. Z.	July, 1917	H. V. RUEHL, Ala.	Nov., 1916
H. J. HUBBARD, N. Y.	July, 1917	G. LINDBORG, Ind.	Nov., 1916
J. C. SKINNER, Vict.	July, 1917	PITTMAN STELL, N. C.	Nov., 1916
D. SHAVER, N. Y.	June, 1917	J. S. FINKENBERGER, Ind.	Nov., 1916
W. R. GELLING, S. Africa	June, 1917	R. D. WIKOM, N. Y.	Nov., 1916
J. H. BAKKER, S. Africa	June, 1917	J. MIKULIK, Tex.	Oct., 1916
A. R. HALLENBECK, N. Y.	June, 1917	C. W. SCHMIDT, Cal.	Oct., 1916
F. C. BOCK, Neb.	June, 1917	T. J. MAGUIRE, N. Y.	Oct., 1916
P. VANDERHAGEN, Mich.	May, 1917	A. W. WAITE, Cal.	Oct., 1916
YOET & HALVORSON, Minn.	May, 1917	C. W. ELLIS, Tex.	Oct., 1916
W. MCCOY, Kan.	May, 1917	J. P. SIMMON, N. S. Wales	Oct., 1916
A. GUSTTLER, Tex.	May, 1917	E. A. KNAPP, N. Z.	Oct., 1916
C. F. J. LORENZ, N. Y.	May, 1917	T. J. HASKINS, N. S. W.	Oct., 1916
A. DATWYLER, Ohio	May, 1917	LOTHIAN & SKINNER, N.S.W.	Oct., 1916
F. PETTIT, Okla.	Apr., 1917	W. B. KNOUFF, Ala.	Oct., 1916
H. G. MARRIOTT, Utah	Apr., 1917	GORHAM BROS., Ia.	Oct., 1916
E. THEBAUDRAU, Wis.	Apr., 1917	W. H. F. BRAUCH, N. C.	Oct., 1916
W. PICKERING, S. Africa	Apr., 1917	CLARK OLDS & Co., Neb.	Oct., 1916
ED. BURROWS, England	Apr., 1917	IRWIN SCOTT, N. Y.	Oct., 1916
L. KAUSCH, Wis.	Apr., 1917	C. E. DURHAM, Kan.	Oct., 1916
J. M. BROWN, Tex.	Apr., 1917	M. RINGO, S. Africa	Oct., 1916
W. BAGLEY, Mass.	Mar., 1917	W. DELLEY, Queens, Aus.	Oct., 1916
B. E. CAMPBELL, Mass.	Mar., 1917	C. D. HUSS, Pa.	Oct., 1916
R. RUFFER, Ill.	Mar., 1917	T. M. BLACKMAN, Pa.	Sept., 1916
G. STANKE, Wis.	Mar., 1917	G. H. TORLINE, Kans.	Sept., 1916
W. H. MILLER, Mo.	Mar., 1917	S. B. PHILLIPS, W. Va.	Sept., 1916
J. C. WOODS, W. Aus.	Mar., 1917	G. E. HARPER, Texas	Sept., 1916
C. BOULTON, N. S. Wales	Mar., 1917	J. J. ILER, N. S. Wales	Sept., 1916
C. A. HAWKINS, Ore.	Mar., 1917	JAMES PONTING & Co., Mo.	Sept., 1916
A. L. MONTGOMERY, W. Va.	Mar., 1917	JNO. GONTINGER, Ia.	Sept., 1916
J. PETERSON, Ia.	Mar., 1917	GEO. FLECKENSTEIN, Cal.	Sept., 1916
J. ANDERSON, Tas.	Mar., 1917	GEO. HILL, Aus.	Sept., 1916
A. J. NEILL, Vt.	Mar., 1917	E. C. BEARD, Aus.	Sept., 1916
ED. DETTRICH, Ind.	Mar., 1917	J. K. GLINICKI, Mich.	Sept., 1916
LEWIS CHASS, N. Y.	Mar., 1917	OSCAR BUEHNER, Md.	Sept., 1916
E. O. LES, S. Dak.	Mar., 1917	A. J. HAMMOND, Cal.	Sept., 1916
S. STEMPLER, Ohio	Mar., 1917	ROBERT MURRAY, Cal.	Sept., 1916
R. S. GUGIBERG, Kan.	Mar., 1917	D. E. WRIGHT, Pa.	Sept., 1916
J. S. HASKELL, Col.	Mar., 1917	J. S. HASKELL, Col.	Sept., 1916
W. L. ROARK, Tex.	Mar., 1917	R. SOMMER, Aus.	Sept., 1916
A. R. BARLOW, Tex.	Mar., 1917	J. A. SEQUIN, Car.	Aug., 1916
C. A. WHITACRE, Ohio	Mar., 1917	JAMES CLARK, Jr., Aus.	Aug., 1916
B. P. CARNRY, Ill.	Mar., 1917	DISPATCH Fdy. Ltd., N. Z.	Aug., 1916
T. J. DORSEY, Conn.	Feb., 1917	A. A. BAHKE, N. D.	July, 1916
F. MARSE, Mich.	Feb., 1917	ERNEST E. DOTT, Ohio	July, 1916
J. H. WHITE, N. H.	Feb., 1917	F. C. ABBOTT, Pa.	July, 1916
MCGOWAN BROS., N. Y.	Feb., 1917	HENRY FISHER, Tas.	July, 1916
W. H. SCHENE, Neb.	Feb., 1917	J. W. FOWLER, N. Z.	July, 1916
A. J. H. WEGENER, S. Africa	Feb., 1917	A. C. LODWIG, Cal.	July, 1916
H. SCHNETTKE, Ill.	Feb., 1917	J. K. HANSEN, Aus.	July, 1916
E. DOUGHERMAN, Ohio	Feb., 1917	J. B. BARKER, Ill.	July, 1916
J. W. HAUGHT, Ill.	Feb., 1917	H. M. LARSEN, Wis.	July, 1916
CHAS. F. GIERE, N. Mex.	Feb., 1917	GEO. P. MACINTYRE, Me.	July, 1916
M. E. GOLLER, Pa.	Feb., 1917	JAS. A. BUCHNER, Mich.	July, 1916
J. POTTSOFF, Neb.	Feb., 1917	H. M. FINGAR, N. Y.	July, 1916
G. M. GARRETT, Mich.	Feb., 1917	L. H. STRANGE, Viet.	July, 1916
ERNEST FINLEY, Pa.	Feb., 1917	P. O'DONNELL, Viet.	July, 1916
A. TILMAN, Cal.	Feb., 1917	R. J. HANCOCK, N. Z.	July, 1916
WALKER BROS., N. Z.	Feb., 1917	F. G. WILSON, Calif.	July, 1916
G. W. WHITTINGTON, W. Va.	Feb., 1917	H. W. FRECHMAN, Mo.	July, 1916
J. H. HOTLS, S. Africa	Feb., 1917	A. J. YEAGER, S. D.	July, 1916
IRVING BROS., N. Y.	Feb., 1917	A. J. MOODY, Va.	July, 1916
F. ROSCHY, Pa.	Feb., 1917	O. DYSTAD, N. D.	July, 1916
AUGUST MILLET, Ill.	Feb., 1917	J. NICOLAISEN, Conn.	July, 1916
C. P. ROBERTSON, S. Africa	Feb., 1917	J. BINGEGGER, Tex.	July, 1916
O. DANNEMAN, Minn.	Jan., 1917	J. STADLER, Cal.	July, 1916
S. HETEM, S. Africa	Jan., 1917	W. HODLEY, N. Y.	July, 1916
G. A. GURLEY, Ore.	Jan., 1917	C. NOWAK, N. Y.	July, 1916
F. K. WADE, Me.	Jan., 1917	A. J. PRUE, N. Y.	July, 1916
L. V. SENN, Neb.	Jan., 1917	F. RINKENBERGER, Ill.	July, 1916
S. H. AUSTIN, N. Y.	Jan., 1917	J. K. LORAH, N. Y.	July, 1916
H. KARL, Ia.	Jan., 1917	J. HENDRICKSON, Iowa	July, 1916
J. H. BERGEN, Kan.	Jan., 1917	J. P. KELLY, Md.	July, 1916
F. G. A. WILLIAMS, S. Aus.	Jan., 1917	F. A. MARSTON, N. H.	July, 1916
B. S. CASEY, Mass.	Dec., 1916	GEORGE TURNER, Ill.	June, 1916
W. DENNER, Mo.	Dec., 1916	J. G. MUELLER, Mo.	June, 1916
J. B. SCHEIDLER, Ind.	Dec., 1916	A. MACHRECHER, Scot.	June, 1916
F. KUMMER, Ohio	Dec., 1916	O. B. STORREY, Penn.	June, 1916
ALFRED CASS, N. Z.	Dec., 1916	J. E. FETTERSON, Wis.	June, 1916
H. GRIMM, Utah	Dec., 1916	H. J. EICHOEST, Mo.	June, 1916
A. H. GOODING, S. Aus.	Dec., 1916	H. L. FAST, Man.	June, 1916
LEONARD SMITH, N. J.	Dec., 1916	A. L. SCHELL, Mo.	June, 1916
C. F. SHAW, Man.	Dec., 1916	E. E. THINE, Penn.	June, 1916
W. ELWARD, Pa.	Dec., 1916	D. E. MCAULAY, N. S.	June, 1916
W. W. EGLY, Pa.	Dec., 1916	J. W. KIRKBRIDE, N. J.	May, 1916
JOS. BOYER, Mich.	Dec., 1916	G. W. STARR, Ill.	May, 1916
J. WILLIAMS, N. S. Wales	Dec., 1916	E. E. ELLAWORTH, Ill.	May, 1916
J. H. W. SCHNEIDER, Cal.	Dec., 1916	J. VERMILYER, Ore.	May, 1916
W. SAUER, Minn.	Dec., 1916	A. S. FORBUSH, Utah	May, 1916
F. F. DARLING, Cal.	Dec., 1916	J. O'ROUKE, N. Y.	May, 1916
CHAS. NEWLAND, Cal.	Dec., 1916	H. ROCKWELL, N. Y.	May, 1916
T. J. BRAHM, Ia.	Dec., 1916	W. RUSSELL, Conn.	May, 1916
P. H. ST. LOUIS, Wis.	Dec., 1916	J. I. DEPEW, Neb.	May, 1916
A. E. NICKOLA, Okla.	Dec., 1916	W. I. HASKIN, Okla.	May, 1916



Knowledge Brings Home the Bacon

ELBERT HUBBARD

EDITOR'S NOTE—Being the first of a series of articles by "The Roycrofters" written for the benefit of AMERICAN BLACKSMITH readers, and which will appear regularly each month in "Our Journal."

In this article Mr. Hubbard discourses entertainingly and instructively on subscribing for, paying for and reading and studying your trade paper. And when Mr. Hubbard says "reading and studying" he means reading with the brain and studying with the brain.

"Knowledge is power," said Francis Bacon. No bullet ever shot by mental Mauser ever found a truer billet, for now it is pretty generally acknowledged that this aphorism of Bacon's is a prime factor in bringing home the succulent breakfast edible that bears his illustrious name.

So everywhere we have the spectacle of eager men and women searching for the springs of knowledge. Why? Oh, so to get a living, increase the bank balance, and fight off the sniffing wolf at the front door. We are recognizing the supreme importance of the here and the now, seeking for ideas and ideals that will improve our efficiency, poise and power.

In these strenuous days, "ists" and "isms" have to bear the scrutiny of reason and the test of common sense and truth. Superficiality gives way to specialty. The smatterer, the literary hobo of commercialism, is succeeded by the business man whose knowledge is based on scientific principles, those of intimate knowledge of cause, effect and values.

And, paradoxical though it may appear, it is this very specialization, this narrowing down to define in-

delible issues, that gives us a wider outlook and a fuller education. Provincialism retards growth. We need to become universalists and to think and act imperially.

"I can't get San Francisco to answer," said a Chicago telegraph operator on the morning of April 16, 1906. "Well, try again," was the answer, "and then if no reply comes call up New York and tell them to call London, and have London call Yokohama, and Yokohama will call San Francisco."

And in half an hour the dread news came.

"Mine and thine," was the yardstick of oldtime business relationship—with the thumb covering an inch at the "thine" end! "Ours" is now becoming the standard of dealing, and business men know this as the foundation of all successful business. And so, to seek knowledge anent the service, the work you offer, is not only profitable monetarily but morally. You become part of the work you do, it mirrors your character and personality.

And no craftsman who realizes this truth will offer inferior material or wretched work. He gives the best he has to his customers and they couple his name with his commodity. Examples of this are on every hand, and "There's a reason." The perfect knowledge obtained by the merchant, artisan, advertiser or business man impels him to seek the best means and the best wares for his customer. Also, knowledge gives him courage, enthusiasm, hope, animation.

Everything must be "all wool and a yard wide." Also, he must know why it is all wool and a yard wide, and impart that information to the prospective customer. So knowledge, therefore, is not simply a question of absorption—it grows by giving. And this growth by giving presumes and proves co-operation. No man can lay claim to education without co-operation. No man can hope for business success unless he gets a grip of that truth.

It is by the perfect understanding of the needs of his customers that the man who "serves" is enabled to cater to them. Call it psychology if you like—it is co-operation. And it is not only necessary that this co-operate understanding be between buyer and seller to build up a successful business; it must exist be-

tween buyer and buyer, dealer and dealer, business man and business man.

In the old days craftsmen carved each other's throats. Later they carved prices. Then they carved acquaintance. Now they co-operate. The inane competition, born of selfish rivalry, which has only one object—success through the failure and elimination of a competitor—is now almost non-existent.

The competition that obtains nowadays is that of friendly rivalry, based on trustfulness, which seeks to merit success. It is emulation; a noble effort to obtain the highest excellence and give the highest good by sustained effort and applied intelligence.

The one-price system and the fulfillment of "promises" have contributed largely to this desirable condition and friendly feeling between business men and business houses. All this has been the result of education. The truths of fraternity and the square deal have been assimilated until they have become the life-blood of industrial and commercial activity.

It is to meet the requirements of these new economic conditions, this thirst for special information on specific subjects, that we have offered to us technical and commercial courses by various schools and colleges throughout the United States. And thousands have benefited thereby. But if I were asked what I consider the chief medium of instruction and helpfulness for the business man of today, I should unhesitatingly say his Trade Paper.

The very fact of being a subscriber and paying for a specific paper, is an education in itself. It tokens a healthful interest in what others are doing in the same line of business, and is bound to make a man a better craftsman and a better citizen. Getting together is the big slogan of today.

Any individual who is alone, whether he realizes it or not, is on the slide to limbus. We succeed only as we move with other people. The man who subscribes to and reads his trade paper, is in sympathy with men and things. He is no atrophied anthropoid or paleolithic anthropophagi, with head growing beneath his shoulders.

He is a glowing coal, a live wire; he is in the line of evolution. The pioneer of all correspondence schools



and courses was a mining paper, run in a country district. Now that great institution gives instruction to million of students all over the world.

And the good trade papers published in America today are fostering and nurturing this knowledge-getting idea. They secure knowledge and give it out. And knowledge is power. Thousands of busy men look to the papers in their field for inspiration and encouragement, and they are not disappointed. Their specialized paper becomes their encyclopedia.

It is a mine from which they quarry the four-square stones upon which

to build the fabric of business success. Nuggets of wisdom and jewels of thought are added to their stock in trade.

These have been tried in the fire of experience and by the acid

test of practicability. Experts and specialists fill your trade paper with contributions of inestimable value to the reader. The well-written columns are filled with advice, information and suggestions. Is it any cause for wonder, therefore, that the subscriber is optimistic, prosperous, respected?

"As iron sharpeneth iron so does man the countenance of his friend." And the trade paper gives to its readers a clearer vision, a broader outlook, a bigger heart. It keeps him from becoming mean, small, petty, pestiferous, with bats in his belfry. It enables him to get a better knowledge of his work and service. It shows him how to handle materials and render that service to the mutual advantage of himself and his customer.

It teaches him that all men are brethren, that nothing goes but truth. That variety in form, color and expression are all in Nature's scheme. And realizing these things he becomes a better business man, a better craftsman, a better man. His "technic" gives place to tolerance and he becomes an interested, enthused business man whose religion is to be good and whose business is his religion.

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The Care, Repair and Operation of the Automobile—8*

(With Special Reference to Overland Cars)

Removal of Carbon Deposit

The removal from time to time of carbon deposits accumulating in the combustion chamber and on top of the piston is necessary for all gasoline motors.

The frequency of this operation depends on severity of service and the

quality and quantity of lubricating oil.

To scrape the cylinders, remove both inlet and exhaust valve caps (Fig. 1) and turn the motor over until the pistons of two cylinders are at their top centers. The scraping off of the deposit is done by means of tools of different shapes, the tools being bent so as to reach the piston head and the sides and tops of the cylinders. Scrape all removed carbon over to the exhaust valve, and when through, turn the motor until the exhaust valve lifts, when you may scrape the carbon past the valve and into the exhaust passage, whence it will be blown out. For a good job, brush the surfaces clean and make sure that no carbon becomes lodged between the exhaust valve and its seat. Finally, wash with kerosene.

In replacing the cylinder plugs over the valves, put graphite grease around the threads; this will make a compression-tight joint and also make it easier to remove the plugs the next time. Likewise, be sure to replace the copper gaskets under the plugs.

It is an excellent plan to attend to removing the carbon and to grinding the valves together.

With ordinary use and good lubrication, valve grinding and carbon

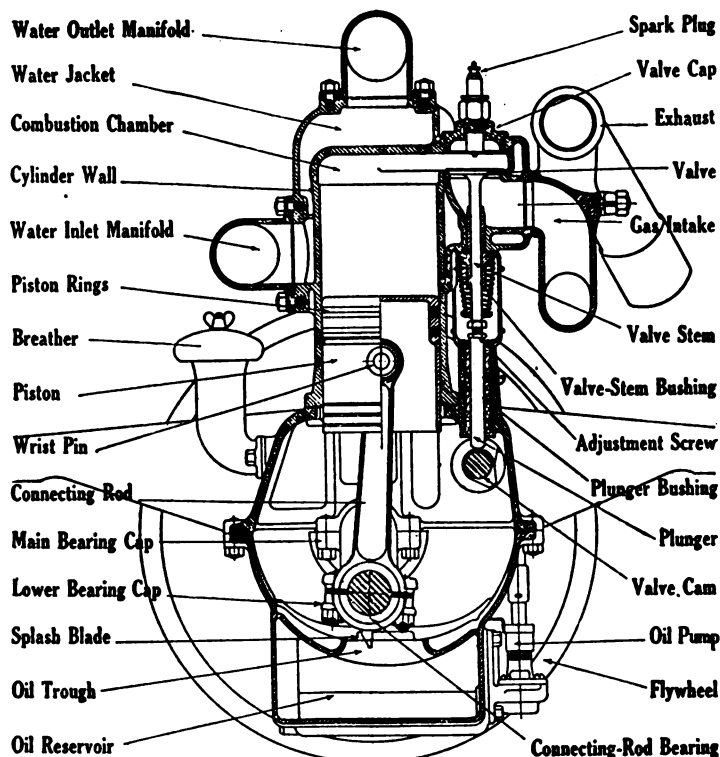


FIG. 2—SHOWING A CROSS-SECTION OF THE MOTOR WITH VARIOUS PARTS NAMED



removal should not become necessary before the car has run from 3,000 to 5,000 miles.

The necessity for scraping may be minimized largely by injecting a tablespoonful or two of kerosene into each cylinder after the day's run, while the cylinders are still hot. Kerosene used in this manner has a strong solvent action, which may be utilized more fully by cranking the motor—with the ignition off—so that the kerosene will work over the entire cylinder surface.

Grinding Valves

To keep the motor in a condition of highest efficiency, an occasional regrounding of the valves is necessary.

Leaky valves indicate their con-

dition by poor compression. Open three of the priming cocks at a time and turn the motor over, slowly, and notice whether the same degree of resistance is met with in each cylinder. In turning the piston over against its compression, if the resistance varies in different cylinders, or if the resistance is slight in all of them, it is time to pay attention to the valves.

FIG. 3—REMOVING THE VALVE

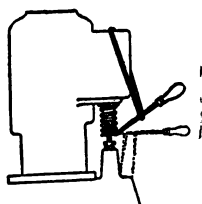


FIG. 4—HOW TO GRIND THE VALVES

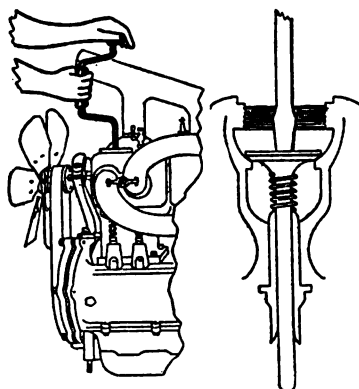
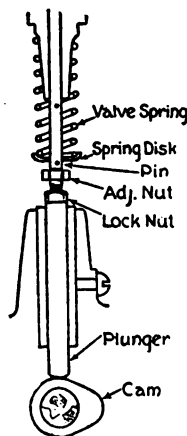


FIG. 5—PARTS OF VALVE MECHANISM



dition by poor compression. Open three of the priming cocks at a time and turn the motor over, slowly, and notice whether the same degree of resistance is met with in each cylinder. In turning the piston over against its compression, if the resistance varies in different cylinders, or if the resistance is slight in all of them, it is time to pay attention to the valves.

The most frequent cause of leaky valves is furnished by carbon deposits on the valve seats. These deposits, by preventing the valve from closing properly, permit the hot gases to cut in streaks over the polished faces of the valve, with consequent pitting.

The grinding of a valve is not a very difficult operation when undertaken with patience. First, it is necessary to remove the valve from its seat. Unscrew the valve cap with the special wrench found in the tool equipment of the car. In the absence of a special spring-lifting tool, the valve spring may be raised

in the manner shown in Fig. 3, that is, either by resting a good-sized screw-driver on a block of wood, or by suspending it in a loop of stout wire.

A regular valve-lifting tool can be made of a $\frac{1}{2}$ -inch iron bar, about eighteen inches long and split at one end. By removing the pressure, the valve-spring pin may be pushed out of the valve stem; this will release the valve-spring cup and the spring itself, while the valve may be pushed up and removed through the opening in the top of the cylinder.

The operation is simplified if an old nut or small piece of wood is placed on top of the valve head and the

however. Give it a half revolution to the right, and another half revolution to the left and then lift the valve round, to avoid "ringing."

It is a good idea to place a light spring around the valve stem before putting it into place for grinding. Then, when you release the pressure after a few turns the spring will lift the valve clear off its seat and a whisk of the brace will turn it before reseating it for further grinding. Keep on as described until the entire contact surface of the valve and seat are polished silver-bright.

A good way to ascertain whether the face of the valve will make an even contact on the valve seat is to mark lines upon it with a lead pencil, about $\frac{1}{4}$ inch apart. Now seat the valve and turn to the right and left, the same as you did in grinding. If the valve is ground with accuracy, each one of the pencil marks will be wiped away. On the other hand, if one line, or a part of one, remains untouched there is an uneven spot.

The most important work comes at the finish. Remove the ball of cotton waste and recover every atom of abrasive from the valve chamber; wash with gasoline or kerosene and then flush the valve guides before you reseat the valve by reversing the operation by which you removed it.

While the valve is out, take a look at the valve stem and be sure to clean it of all carbon or grit. If any of this remains, the deposits may grind out the diameter of the valve guide.

Finally, verify the clearance between the toe of the valve stem and the plunger (Fig. 5). When the valve-stem toe is in the lowest position you should just be able to insert a thin visiting card between it and the plunger. This is the proper adjustment for both intake and exhaust valves.

Attention to the valve-stem clearance usually becomes necessary when the valve becomes lowered as the result of repeated grindings. If the valve has more than that clearance between stem and plunger, change the adjustment as follows:

Loosen the locknut on top of the valve plunger and screw the adjusting nut upward until you have the proper adjustment.

Remove and grind in one valve at a time and be careful to return the valve to the cylinder from which you

valve cap replaced temporarily; this will prevent the valve from rising together with the spring and make the removal of the valve-spring pin easier.

Plug up the opening leading into the cylinder with a ball of cotton waste, to prevent any of the grinding material from entering the cylinder, where it would be certain to score parts which had all the grinding they needed before they left the factory.

Another important consideration is to have the best grinding material obtainable. There are several prepared valve-grinding compounds on the market, but a very satisfactory abrasive may be had by mixing flour of emery, of the grade known as No. 120, with a little kerosene or thin lubricating oil, until it has the consistency of a paste. Smear this paste thinly on the valve head and on the seat. Use a brace and a screw-driver of generous size to turn the valve (Fig. 4). Do not skim it around,

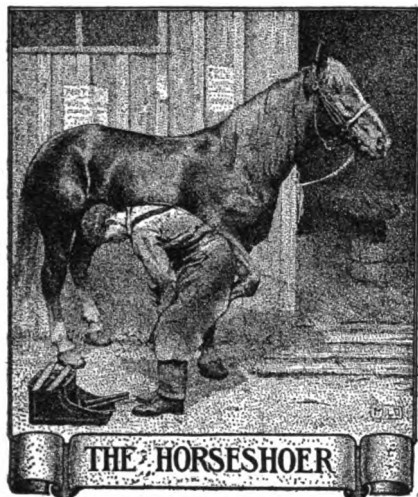


removed it; this is important. Also, do not put an inlet-valve spring in the place of an exhaust-valve spring, which has greater tension.

As a rule, the intake valve requires less attention than the exhaust valve, because the former comes into contact only with the incoming fresh gasoline charges, whereas the latter is apt to become fouled by the burnt-up and dirty exhaust gases.

Judicious lubrication will keep the necessity for valve grinding down to reasonable limits.

(To be continued)



Unsoundness in Horses—2

H. C. WILKIE, F. R. C. V. S.

Standing at the horse's shoulder, facing the same way as he, the shoulder-joint must be examined, the knee, the cannon bone, and the great extensor tendon reaching to the foot. The condition of the fetlock-joint, the pastern, the coronet and the wall of the hoof are then examined in turn.

Turning round, the scapula or shoulder-blade must be noted, the condition of the elbow-joint, the great flexor tendons, the great suspensory ligament, the small sesamoid joints at the back of the fetlock, the pastern, the condition of the lateral cartilages, and the skin of the heel.

I usually then raise the foot from the ground, and examine the condition of the metacarpal bones and the flexor tendons as they are relaxed; then the lateral cartilages in this position, which often enables us to determine the presence of small side bones. The under-surface of the foot is then noted, the frog, sole, and bars.

In the examination of the feet it is necessary to be especially cautious not to form an opinion until the hoofs have been washed and there has been an opportunity to observe such defects as sand-cracks, false quarters, thrush, canker, corns, seedy-toe, pumiced sole, and others.

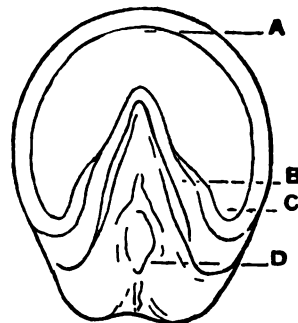
Having so far examined the near fore leg, the heart and left lung should be examined by auscultation, the ribs for any fractures, and the hand passed over the back for the detection of sit-fasts, eruptions, etc.

Approaching the hind limb, the most prominent spine of the pelvis demands attention, as it is a part very liable to fracture and other injury—fractures of this part seldom if ever becoming knitted. The stifle-joint is next examined—the navel and the penis and scrotum, if a gelding or stallion—or the teats and udder if a mare. These latter examinations are very necessary, because, in the case of a gelding, a tumor of one or both cords (scirrhus cord) may exist, which is bound to be troublesome sooner or later. In the stallion a healthy condition of these parts is most essential: Growths on the penis, rupture into the scrotum or inguinal canal, hydrocele, absence of a testicle, and many other defects may exist which will not be detected unless carefully and specially looked for. In the mare there may be an old injury, or absence of one or both teats, a hard, indurated condition of the udder which renders it useless or partly so for milk production, or a parasitic condition of one or both glands which is known as botriomycosis. In passing behind the animal the tail requires a glance, and it should be elevated and the condition of the anus observed.

I remember a case where a man bought a very nice looking mare which he thought to be sound, but he afterwards discovered there was a laceration and a permanent way between the rectum and the vagina. He brought it to me to ask me what he was to do, so I advised, as there was no guarantee and no certificate of soundness, that he had better make the best of a bad job, and in the future buy only subject to examination.

The examination of the right side and limbs being the same as that for the left requires no further explanation; so having gone over the horse as he stands, he should then be sad-

dled, and, with a man on his back, walked at his ordinary pace about 50 yards from the examiner and back again towards him.



THE SOLE OF THE HOOF
A—SEAT OF SEEDY-TOE
B—WHERE CANKER USUALLY FIRST MAKES ITS APPEARANCE
C—SEAT OF CORN
D—SEAT OF THRUSH

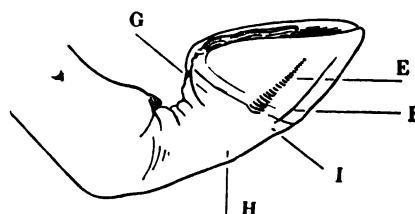
This walk and turn frequently reveals much to the examiner. Many errors of action, the manner of placing the feet upon the ground, the movements of the hocks, stifles, knees, and fetlocks are all best seen at this pace.

The horse is then trotted slowly to and from the examiner, and, as regards this pace, I may say that the horse should never be hustled into a fast trot at first.

The slow trot is probably the pace of all others in which defects are revealed and the action of any abnormality either of bone or tendons is detected most easily.

After being satisfied with the walk and slow trot, I often like to see a horse trot fast and then canter, but these paces do not give much more information than as to quality of action and style, and so far as actual soundness is concerned might in some cases be dispensed with.

The examination of the wind is next made—and with light horses this should first be tried at the canter. At a hand canter a great many horses with defective wind make more



SIDE VIEW OF FETLOCK AND FOOT
E—FALSE QUARTER
F—SAND CRACK
G—SEAT OF SIDE BONE
H—SEAT OF RING BONE
I—SEAT OF LOW RING BONE

noise than they do when galloped, and so it is best always to canter first and gallop afterwards.

In the case of draught horses, these should be lunged in a circle on soft ground or made to pull a load sharply up hill.

With stallions, colts and fillies which have not worked, the wind is tried by lunging

Some horses require to be put to much greater exertion than others before they exhibit defects of wind, while others, as before stated, make more noise (as in many whistlers) at the slower pace. It is therefore necessary to be on guard against deceiving oneself in this manner. When a bridle is used the throat latch must not be so tightly fastened that there is pressure upon the larynx when the head is pulled in, as this in itself is capable in some horses, especially fat ones, of producing a laryngeal sound.

I recently had to give evidence in a case of alleged breach of warranty, where the breach consisted in defective wind, and there were a great many witnesses called on both sides. The thing which struck me as being most remarkable was the great confusion of terms which existed, and blowing, roaring, thick wind, broken wind, grunting, and some terms which were apparently manufactured for the occasion, were indiscriminately used, most of the witnesses being absolutely confused as to what the common affections of the wind in horses are. The ordinary terms in use have well-defined meanings and indicate well-known conditions.

It may be of some service if I briefly recapitulate some of the more common of these and the causes that give rise to them.

Broken wind exhibits itself by a peculiar heaving of the flanks, due to the fact that although the air is inspired into the lungs about normally the expiratory movement is a double effort. It is due to an affection of the lungs called emphysema, and is accompanied by a characteristic cough, called the broken-winded cough.

Roaring is a harsh noise made by the larynx or specialized upper portion of the windpipe, and is due to a paralysis of certain of the muscles of this organ. The noise is made as the air is drawn into the lungs in ordinary cases, and it is only in advanced cases that a noise is also made on expiration. A harsh, hollow cough accompanies roaring.

Whistling is a shrill sound emitted by the larynx, and is usually an early stage of roaring. Whistling is in some cases due to a temporary affection of the larynx, and such cases must be differentiated from chronic ones or those which will become roarers.

High blowing is a sound made by the action of the nostrils, and is due either to habit, want of condition, or naturally small nostrils. It usually disappears on increased exertion, and is not in any case an unsoundness.

Thick wind is an obstructive sound referable in most cases to some portion of the nasal passages, the pharynx, and in some cases to the lungs. Malformation of the nasal bones, pharyngeal or nasal polypi, catarrhal conditions, and many others, are among the causes of thick wind.

The obstruction caused by the position of the head and neck when an excitable horse is being held back sometimes gives rise to the emission of a noise of this character.

An Improved Oxy-Acetylene Welding Plant—3

ALBERT H. WAYCHOFF

The Torches or Blowpipes

Much, in fact nearly all the success of an autogenous welding outfit, depends on the blowpipe. In trying to design the torch for my outfit, is where I came very near to quitting because of successive failures.

To make the torch you will require the following materials as shown in Fig. 5.

1—One-quarter-inch brass tee (iron pipe size) (A).

3—One-eighth to one-quarter-inch bushings, brass (B and C).

1—Piece of brass rod three-quarter inch diameter four inches long for making tip (D) or Fig. 6.

1—Piece of one-eighth-inch brass pipe (iron pipe size) 20 inches long (F).

1—Piece of one-eighth-inch brass pipe (iron pipe size) 11 inches long (G).

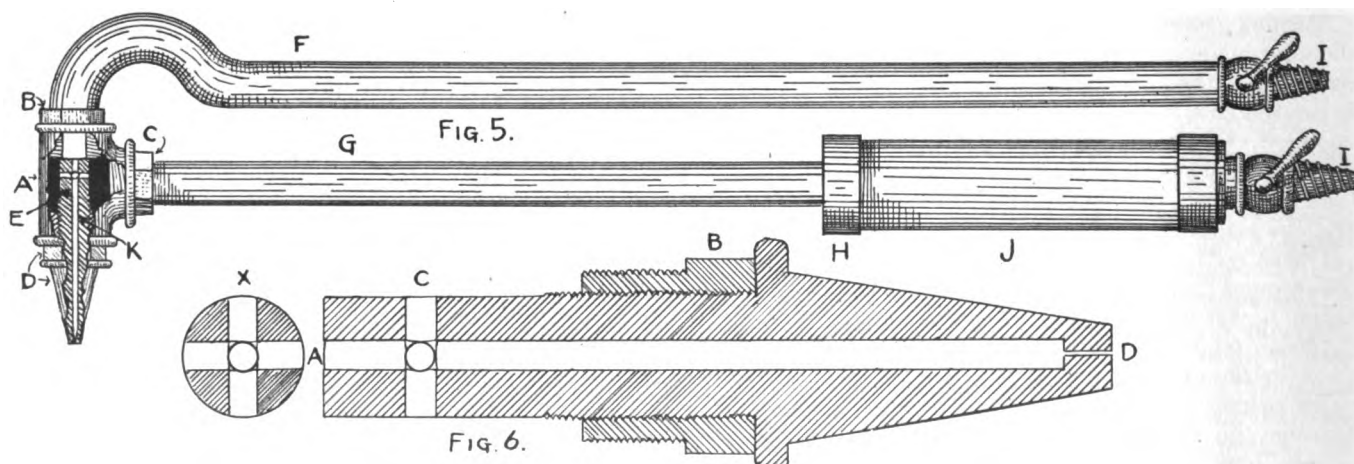
2—Three-quarter-inch caps of brass (iron pipe size) (H).

1—Piece brass pipe three-quarter inch (iron pipe size) (J).

2—Lever gas cocks (I), one-eighth inch.

A small quantity of mineral wool.

To make the torch put one of the bushings in the side and the other at the end of the tee as shown in Fig. 5, also a bushing in the other end at D, Fig. 5. Then take the piece of brass rod and if you possess a lathe turn it down as shown and thread it so it will fit the bushing at D, Fig. 5. The end should be long enough to reach clear through the tee so



FIGS. 5 AND 6—SHOWING COMPLETED TORCH (TIP AND MIXER IN SECTION) AND ALSO DETAIL OF ONE OF THE TORCH TIPS



when it is screwed up tight it will come up against the bushing (B), Fig. 5, forming a tight joint. The pipe (F) is put into the bushing (B) and forms a stop for the tip (K). The point of the tip below (D) should be turned to a conical shape as shown in Fig. 5, the point being about one-fourth inch in diameter.

Then to finish the tip we refer to Fig. 6. A hole one-sixteenth inch in diameter must be drilled down to within a quarter inch of the point at D. Then at (C) a one-sixteenth-inch hole must be drilled through from each side making a hole to the center from each one-fourth of the circumference (see X). The hole at (D) varies in size according to the work to be done, from the size of a needle to one-sixteenth inch.

It is necessary to make several of these tips or nozzles, with the holes at (D) of different sizes. When you have the tip finished you then thread pipes (F) and (G) on each end and screw into the torch head as shown in Fig. 5. Then take the piece of three-quarter-inch pipe (J), Fig. 5, and thread each end. Then fill loosely with mineral wool. Then tap out each of the caps (H) for one-eighth inch and assemble as shown,

In making the connections and joints in putting the torch together use litharge and glycerine on all but the tip, this may be put in with a little graphite and oil. Always be sure that your connection between bushing (B) and the end of the tip is perfectly tight. If it isn't a great deal of the efficiency of the torch is lost.

For the connection of the torch to the generators use a good quality of high pressure hose, which should be at least ten feet long or longer. Connect the hose to the outlet pipes on the generators. There should be threads cut on both these outlet tight pipes, and the hose forced on as as possible, and securely clamped on with three or four hose clamps. If one of these hose connections should happen to blow off, especially on the acetylene generator, it would probably seriously burn the operator if he were working with a lighted torch close by.

The pipe (B), Fig. 5, is the oxygen pipe on the torch. It is a good idea to paint the generators different colors, say the acetylene generator a bright red and also the hose. This is necessary in some cities. The oxygen generator may be painted black or green. This helps to pre-

holes (C), Fig. 6, and when they emerge from the tip they are mixed and burn with great heat. The piece of three-quarter-inch pipe (J), which is filled with the mineral wool, serves as a handle for the torch. Its main use, however is to prevent what is known as a flushback from passing any farther back than this point.

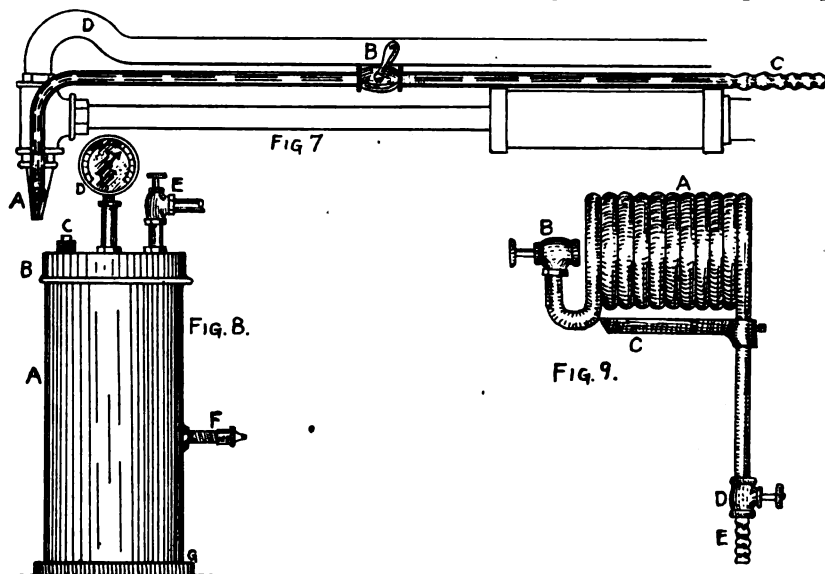
To light the torch, first turn on the acetylene till a good-sized blaze is obtained and the gas is burning slightly with a blast, then gradually turn on the oxygen till a distinctive white cone is obtained. If on reducing the flame by the addition of oxygen the torch happens to go out, it shows that not enough acetylene is being used. In operating this torch it should not be burned with blast enough to blow away the particles of molten metal while making a weld.

Cutting Torch

You can use the same retort and scrubber for cutting that you do for making the welding flame, but I would advise making a separate outfit entirely.

The reservoir should be made of a piece of eight-inch standard pipe, seven feet long or longer. The cutting pressure should be at least one hundred pounds, and one hundred and twenty-five pounds is better, and for heavy cutting the pressure must go as high as one hundred and seventy-five pounds. The tables given later will tell you the proper pressure to use. Really the most satisfactory way of getting a high-pressure oxygen for cutting purposes is to purchase a small air compressor such as is used in most auto garages, for pumping up tires. A water-cooled compressor large enough for this purpose can be bought for about twenty dollars. The oxygen generating at the high pressure from potassium chlorate is a little dangerous.

Fig. 7 shows how to make and attach the cutting torch. This torch is simply a piece of one-eighth-inch brass pipe (iron pipe size) with a valve or gas cock (B) ahead of the valves on the torch. The tip or nozzle is made of a piece of half-inch brass rod one and one-fourth inches long. These tips should have a hole through them about one sixty-fourth inch in diameter. A clamp must be made to hold the cutting torch on the side of the heating torch.



FIGS. 7, 8 AND 9—SHOWING CUTTING TORCH, GASOLINE PRESSURE TANK, AND THE PREHEATING TORCH

putting on the gas cocks, and the torch is finished.

The standard length of torches for all-around work is usually eighteen inches, but they may be made any length desired by the operator. In fact I think it a good plan to make two or three torches of different lengths, as they are not expensive.

vent getting mixed up, and always be sure to put the oxygen hose on the gooseneck pipe (F.)

The principle of this torch is that the oxygen is always used at a higher pressure so it serves as an injector. The stream of oxygen rushing through the hole (A), Fig. 6, creates a suction, sucking in the acetylene through



The theory of the cutting is to first heat the metal to a red heat with the torch and then a stream of pure oxygen is sent through the tip of the cutting attachment as shown in Fig. 7. This oxygen unites with the carbon of the metal and disintegrates it with great rapidity. The cut is narrow and if the oxygen pressure is high enough the cut is almost as smooth as if cut with a shear or a saw.

The cut can be made any shape, hence it is a very valuable outfit around the shop. Have the cutting attachments to cut out circles in boiler plate, or holes for putting risers in pipe, or other irregular pieces of iron or steel or for making press dies, etc.

In cutting metal, objects up to eighteen inches may be easily cut with the torch, and up to a thickness of an inch and a half to two inches may be cut to an exactness of about one thirty-second of an inch; above this, it can be cut to an exactness of about three sixty-fourths. The width of the cut also increases with the greater thickness of the metals, ranging from one-eighth of an inch on light material to three-eighths on heavy. One of the main advantages of cutting steel with the oxy-acetylene process is that chrome steel or other hard steels can be cut as easily and cheaply as any soft steel, in fact there is no difference between soft, tempered, hardened, carbonized or harveyized steel, and a nickel chrome, high manganese, or high carbon steel cuts as easily as any of the low carbon steels.

A method used by many and which is a very satisfactory plan, is to buy oxygen for the cutting process. The oxygen comes in high pressure tubes at from 500 to 1500 pounds pressure. In case this is used it is necessary, however, to get a pressure regulator which is a rather expensive little device. These regulators can be set at any desired pressure by means of a thumbscrew, and no matter how high the pressure is in the tube it will not allow the pressure to go above the desired point in the torch.

Preheating and Preheating Torches

There is considerable difference in opinion among operators in regard to preheating work. But most of them claim it is not of much value. In my experience, however, I stand out strong for preheating in all cases possible to do so. In the first place I believe it makes more rapid pro-

gress possible and I know it means quite a saving in cost of doing the work. Acetylene gas costs on an average one to one and one-half cents per foot, depending on the locality, carbide costing more in some localities than in others, while there seems to be a slight difference in the quality and quantity of gas from the different carbides. Oxygen when made with this generator costs from two to three cents per foot, also depending on the different prices in different locations, and of the quality of the potassium chlorate and the manganese dioxide. With the preheating outfit the hydro-carbon gas used is made of gasoline and costs from one-fifth to one-third of a cent per cubic foot, and in some localities even less than this. Now if the article to be welded is first brought up to a pretty fair heat with the hydro-carbon flame, you can easily see that the result is a considerable saving. Again my belief is that, especially on cylinders, water-jackets and such castings, if they are preheated with the larger hydro-carbon flame, when they are cooling after the weld has been made, the contraction which naturally comes by cooling is more even and will not subject the weld to any strain, the whole metal cooling together. This may be just an idea of mine, but it looks like common sense. If you possess a hydro-carbon brazing torch and tank you are that much ahead; if not, here is how I make one which works very satisfactorily. Referring to Fig. 8, which is the gasoline pressure tank, you need the following material:

- 1—Six-inch standard pipe, 18 inches long, threaded both ends (A).
- 1—Six-inch malleable cap (B).
- 1—Three-quarter-inch plug (C).
- 1—Gauge, to sixty-pounds (D).
- 1—One-eighth-inch angle valve (E).
- 1—Ordinary valve and stem out of a bicycle tire (F).
- 1—Flange and plate for six-inch pipe (G).

The illustration, Fig. 8, is so plain description is hardly necessary for putting this tank together. The pressure, which should be from thirty to fifty pounds, is had by pumping up with an ordinary bicycle foot pump. In filling at plug (C) only fill the tank about half full of gasoline.

The burner is shown in Fig. 9, and requires the following material:

1—Piece of one-eighth-inch (iron pipe size) copper pipe about 6 feet long (A). This is for coil.

1—One-eighth angle needle-point valve (B).

1—One-eighth-inch globe valve (D).

1—Metal pan for gasoline for generating (C).

1—Short piece of pipe for making hose connection (E).

To make the torch, thread each end of the pipe (A) and bend or wind a coil around a piece of one and one-fourth inch standard gaspipe. The illustration, Fig. 7, shows how torch or burner should be put together so there is no use of further explanation.

Connect up with the tank with a piece of extra heavy hose. As gasoline soon cuts out rubber hose the best thing to use is a metal flexible hose for this purpose.

To light the burner, fill the pan (C) with gasoline and allow it to burn around the coil (A) till pretty well heated, then open valve (B), which should give a strong blue flame and a temperature of about 2500° to 3000°.

In preheating brass, copper, and aluminum care should be taken not to preheat too strongly as this burner will melt any of these metals easily if working properly.

Two of these burners make an excellent brazing fire also, and can be used pretty successfully on brass or copper castings, although the oxy-acetylene process is much better.

This preheating outfit will easily save what it cost in a very short time in the saving of oxygen and acetylene gases and time, and I believe does help the weld some too.

(To be continued)

The Iron Blacksmith

ANONYMOUS

Old England has her great warriors,
Her princes and poets great;
But the blacksmith is not to be quite forgot
In the history of the State.

He is rich in the best of all metals,
Yet silver he lacks and gold;
And he payeth his due, and his heart is true,
Though he bloweth both hot and cold.

The boldest is he of incendiaries
That ever the wide world saw,
And a forger as rank as e'er robb'd the bank,
Though he never doth break the law.

He hath shoes that are worn by strangers,
Yet he laugheth and maketh more;
And a share (conceal'd) in the poor man's
field,

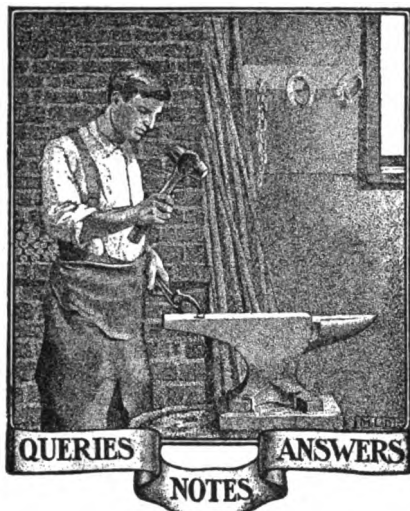
Yet it adds to the poor man's store.

Then, hurrah for the iron Blacksmith!

And hurrah for his iron crew!

And whenever we go where his forges glow
We'll sing what A MAN can do!

(Sent in by Mr. I. J. Stiles of New Jersey)



To Harden Plow-Lays.—Will some one kindly advise us just what chemicals to use in making a dip-bath for hardening plow-lays?

GRANTHAM BROS., North Dakota.

In Reply.—An easy method to harden plow-lays is as follows: Heat the steel to cherry red and then sprinkle with prussiate of potash and plunge into a strong brine to which a little saltpeter has been added. This will give good results.

A. H. F., Pennsylvania.

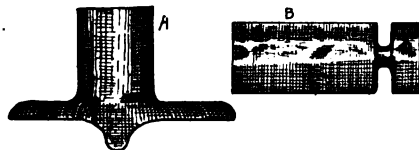
A Bad Case of Foot Disease.—Will you kindly advise me through the columns of THE AMERICAN BLACKSMITH, the cause, how to treat, and how to shoe the following case:

(a) Lameness at hind foot, sole bruised and hollow and filled with a watery substance underneath. (b) Outside horn entirely separated from the quarters around toe, and hollow most all the way up. This condition has practically healed up, there is no evidence of pus, but there is about three-fourths of an inch space between outside and inside horn. There is no horn at toe that will stand any weight, and the pressure from the sole causes her to walk lame. This condition was noticed about a year ago, and I have been treating with wool-fat, oakum and leather underneath the shoe for at least eight months.

Information on this subject will be greatly appreciated.

H. F. HOFFA, Pennsylvania.

In Reply.—The foot is evidently in very bad shape and one trouble is no doubt what is generally known as seedy toe. Treatment for this trouble has been suggested a number of times in former issues



A SPECIAL FORGING

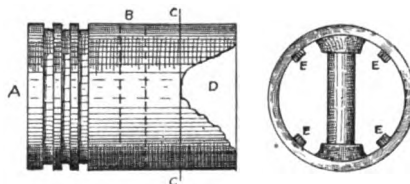
of "Our Journal." The other trouble resulting in a watery sole may be thrush or a class of quitor. In any case, as in the case of seedy toe, all separated horn should be removed and carefully pared away as it is impossible to again make this separated horn grow healthily to the foot structure. Removal of the diseased portions of horn will make the growing of healthy structure very much easier and will also make imedication and sanitation of the foot a very simple matter.

L. G. HALL, New York.

Repairing a Broken Piston. The piston was not only broken, but also badly cracked in several places, thus rendering it dangerous for further work.

After gripping the piston in the universal chuck, I set the parting tool to work and cut the piston off above the break. I then turned a ring to correspond with the piece cut off the piston. After this, I made four liners and pined them onto the piston, and then after putting on the new piston, I brazed the old piston and the ring together, using an ordinary brass wire and borax for flux, and a kerosene torch to supply the necessary heat. After this treatment, I expected to find the piston somewhat warped, but instead, it had turned out in very good shape. When I came to return the piston to the cylinder, I discovered that it had expanded about a 64th of an inch, which enabled me to take a shaving off and thus turn out a perfect repair job.

I have since refitted a loose piston of a small gasoline engine by bringing it to a white heat, covering it with borax, and



REPAIRING A BROKEN PISTON

allowing it to cool slowly. After this treatment, and allowing for the original looseness, I was able to take off a good 64th of an inch. The piston was three inches in diameter, and whether the borax caused the expansion or not, I cannot tell.

HAROLD HENDE, New Zealand.

Spring Work and a Special Forging.—An English brother asks for information regarding springs which have become flattened, and I will endeavor to describe the methods I know.

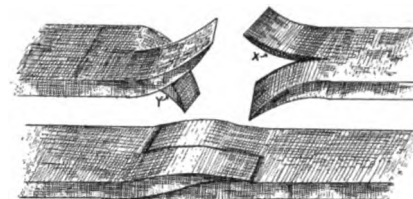
I have set up springs by heating the whole length just warm enough to work them with a hand hammer. Get main leaf where wanted and then follow with the rest leaving about 3/4 inch open. Cool the first one and also the rest as they are fitted, and I think the spring will stand up all right. Of course, the best and only correct way is to send springs to the factory, but sometimes one cannot spare the time to do this.

As to the connecting rod forging, it can be jump welded or drawn out of the solid; the latter being the safest. To jump it on, one should have a bottom swage with a hole through the shank so as to take the 3/4 inch piece (if it is to be machined, it must be larger). To prepare the stock, take a short piece of 3/4 inch, upset the end and make as shown in engraving at A. Then take a piece of 1 1/2 inch (this need not be upset as the extra stock allows for working) and with a bull-nosed punch, spot it for the tip A, get a good heat and the job can be finished up with the one heat.

To forge another way: Take a piece of three-inch by 1 1/2 inch stock and fuller in as shown at B. Draw out about 3/4 inch and then cut off and round up for barrel.

Still another way: Take a piece of good iron or machine steel, fuller in and draw out 3/4 inch from end, then split and turn out the ends for 1 3/8 piece. This is not as reliable as the second method because the ends are almost too short to turn well. The hole in these two can be punched and worked out, but there would be no saving from this way, therefore it is best to drill.

H. N. POPE, Connecticut.



HOW TO WELD SPRINGS

Nickel-Silver Plate and Cast-Iron Brazing Formulas.—In reply to Mr. Bert C. Lester's query as to how the nickel plating dip is made; here is the formula I use:

Pure Block Tin five pounds.

Antimony two ounces.

Bismuth two ounces.

First of all, melt the antimony, then add the tin, and when these are melted, add the bismuth. This makes the same metal as the Royal Silver or Nickel-Silver process.

In reply to Mr. Lester's other query regarding a formula for a cast-iron brazing, use the following:

Powdered Borax one pound.

Marble Dust one-fourth pound.

Clean Powdered Glass one-fourth pound.

Carbonate of Iron ... two ounces.

Mix all together thoroughly, then take a small portion of this mixture, and mix to a thick paste with water, and paint all around the place to be brazed and about 3/4 of an inch back from the break. Clamp or wire the broken article together and heat to a bright red in a clean fire. Then apply the soft brazing wire until it melts and allow the article to cool to a black color before removing from the fire. If all grease and dirt have been entirely removed, the job will be found perfect.

A. H. WAYCHOFF, Colorado.

Brazing Formulas and Spring Welding.—I am sending herewith a formula which will answer Mr. Bert C. Lester's request and which I use almost daily.

The ingredients for this flux can be had at any first-class drug store, and should not cost more than fifty cents (I pay 38 cents for it here). Take:

One lb. Boric Acid.

4 ounces of pulverized Chlorate Potash.

3 ounces of Carbonate of Iron.

Mix thoroughly and keep perfectly dry (a glass jar will answer) and when wanted, a small amount should be taken and mixed with grain spelter. Add clean water to make a thick paste and use a gas forge if possible. An ordinary forge will do if a gas forge is not available, but when a blacksmith's fire is used, use charcoal. Clean the casting of all grease and clamp tightly in place, heat to a good bright red before applying flux and then apply liberally with an iron rod flattened down on end. Work flux along fracture, gradually raising heat to nearly white heat, then shut off blast and allow to cool slowly. If work is properly done, the joint will be as strong as the original casting. Be sure and have joint clean, and clamp as tightly as possible.

Another formula is as follows:

One lb. of Boric Acid.

Three ounces of Caustic Soda.

Three ounces Carbonate of Iron.

Mix same as other formula and keep perfectly dry.

In answer to Mr. W. M. Mills, "Boraxette Welding Compound" made by the Cortland Welding Compound Company, Cortland, N. Y., is the best flux I have ever used for any kind of steel. Use the scarf as shown in the engraving in welding auto springs. A good way to make this weld is to draw the inside of lap to a thin edge as shown at x and not leave it square as at Y.

JOHN A. CURLEY, New York.



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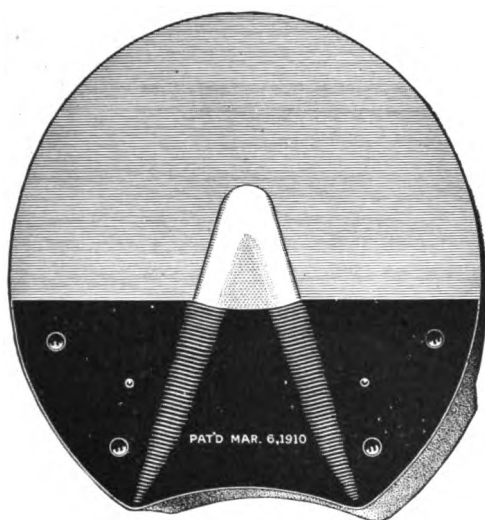


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HOOF SIDE

Walpole Rubber Heels FOR HORSES

**A Satisfaction to the Horseshoer as well
as the Horseowner**

Now, Mr. Blacksmith, here is straight talk for you. The next time a sore, tender-footed horse comes limping into your shop, persuade his owner to have a set of Walpole Heels put on the animal.

You know that horse will soon travel off sound and smooth.

Tell his owner that.

Tell him that this will be as much comfort for the man who drives as it is for the horse, and it makes the horse worth more, too.

Tell the owner that when that horse hits a hard pavement or macadamized road, the Walpole Rubber Heels will absorb the shock and protect the horse's whole foot.

Show him the patent spring steel plate that re-inforces the whole heel and keeps anything from working up into the hoof against bruises and corns.

The Walpole Heel beats the old fashioned hoof pad, because it never gets

floppy and useless after getting wet. The spring steel plate prevents that.

Walpole Heels are better than the bar shoe, because they can be regulated so as to relieve soreness and tenderness in the horse's foot every time.

Your customers will be better satisfied after they once use Walpoles, and you'll know that you have done the best job you could for horse and owner.

You will hold your trade better if you can get your patrons to use Walpole Heels.

If you have not got them in stock, send to your jobber and get them right away.



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Walpole Rubber Company

185 Summer Street

BOSTON, MASS.

THE AMERICAN BLACKSMITH

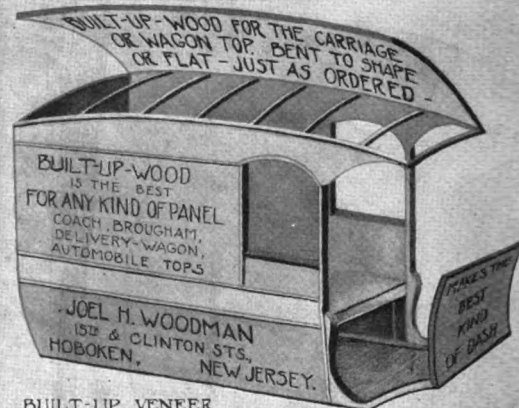
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HART'S

A Threading Outfit that is suitable for general shop use—the “**DUPLEX**” Bolt Die Stock Set “**A**”, range $\frac{1}{4}$ to $\frac{3}{4}$ in. It contains dies that adjust without a wrench and require no reversing when cut is finished. A variety of sets with desirable ranges.

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BUILT-UP-WOOD FOR THE CARRIAGE OR WAGON TOP. BENT TO SHAPE OR FLAT—JUST AS ORDERED.

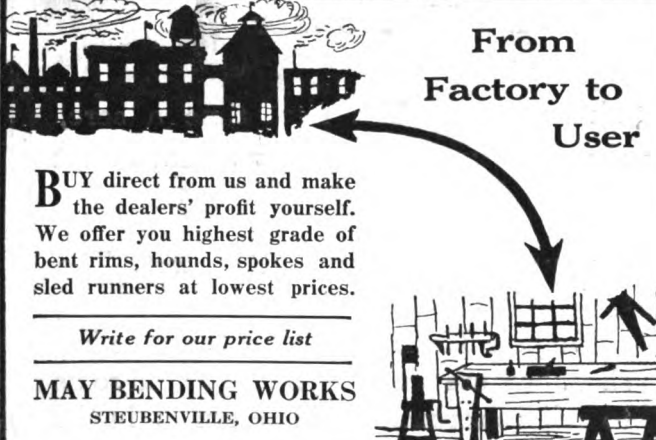
BUILT-UP-WOOD IS THE BEST FOR ANY KIND OF PANEL COACH, BROUGHAM, DELIVERY-WAGON, AUTOMOBILE TOPS.

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ANY SHAPE OR THICKNESS FOR AUTOMOBILES & WAGONS

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MAKES THE BEST KIND OF BASE



From Factory to User

BUY direct from us and make the dealers' profit yourself. We offer you highest grade of bent rims, hounds, spokes and sled runners at lowest prices.

Write for our price list

MAY BENDING WORKS
STEUBENVILLE, OHIO

ABOVE THEM ALL
STAR HACKSAW BLADES

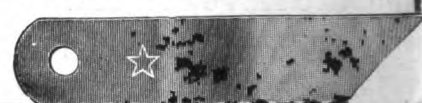
are above all others in quality, durability and performance. They are exceedingly popular with dealers and users because of their fine quality and adaptability.

Star Blades with 14 teeth to the inch are suitable for every class of work except tubing less than $\frac{1}{4}$ in. For such work use a **Star Blade** with 24 teeth to the inch. The reasons which make **Star Blades** good to sell also make them good to use. Write for our interesting proposition.

Standard for 25 years.

Our FREE book “**Tool Practice**” is worth while sending for.

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“The Capewell” TRADE MARK

The most satisfactory and safest way to shoe a horse is to use “The Capewell” nail.

Drives easiest, holds best, and is the most economical.

The Capewell Horse Nail Co.
HARTFORD, CONN., U. S. A.




Notice of Patent Suit

Having frequently advertised in Trade Journals and Circulars that we would bring suit against makers and users of Hydraulic Tire Setters that infringe our Patents, this is to notify the general public that we have begun our first suit, in the U. S. District Court for the Southern District of Illinois, against Robert Fizzel of Litchfield, Ill., he having been using for several months a Little Giant Tire Setter. We shall continue to ask the Courts for the protection of our rights from makers and users of Hydraulic Tire Setters that infringe our Patents.

LOURIE MANUFACTURING CO.
SPRINGFIELD, ILL.

The best money maker for a Blacksmith, is a **SCIENTIFIC**.




“PIONEER” SHAFT ENDS

Fill the Bill
Every
Time

When you order Shaft Ends say
“Pioneer” first

TRADE  MARK

His MASTER'S CHOICE

CRANDAL, STONE & COMPANY :: BINGHAMTON, N. Y.

AMERICAN BLACKSMITH

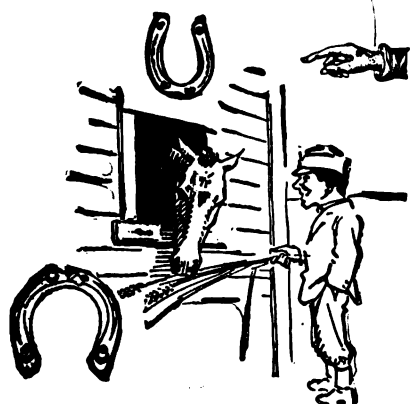
A Practical Journal of Blacksmithing and Wagonmaking

BUFFALO
N.Y. U.S.A.

NOVEMBER, 1912

\$1.00 A YEAR
10c A COPY

Our Free Advertising For You Beats Coupons and Makes You an Independent Merchant



Good Shoeing Will Help More Than Good Luck

You cannot count on luck to keep your horse on his feet. But you can always bank on

"GOLDEN" RUSTLESS RING-POINT CALKS

to carry him safely over ice, snow and slippery pavements.

It's a stubby, wedge shaped core of steel that gives long life to Ring-Points.

It's welded in—stays in. It cannot work loose and fall out like the wobbly pins in wire centre calks.

When you buy Ring-Points you get sharp wear—not dull waste.

They cannot rust, stick or break in the shoes. The "Golden" Plating makes them immune to all forms of corrosion.

Let me put a set on your horse today.

JOHN SMITH, Horseshoer

Cuts Like These Sent Free to all Horseshoers.

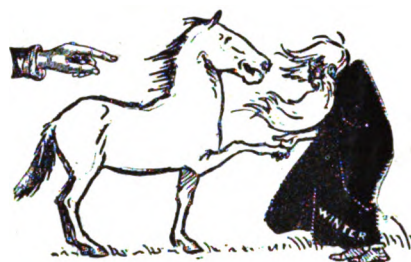
Write to-day for full ad. sheet and application blank.

Something Brand New

FREE MOVING PICTURE SLIDES WITH YOUR NAME AND ADDRESS FOR THE MOVING PICTURE SHOW IN YOUR TOWN.

BE THE FIRST AND CREATE A SENSATION.

Write for our advertising special today and learn about our free booklet distribution to your customers, free posters on your shop, and free benefit sickness and accident fund for you and your family.



Your Horse Will Laugh at Winter

He can't slip, and measure his length on the icy streets and roads. You won't have to coddle him in the stable when you need him in the shafts if he is sharp-shod with

"GOLDEN" RUSTLESS RING-POINT CALKS

When you see the WEDGE SHAPED CENTRE OF TOOL STEEL you won't wonder why they wear. You cannot get such toughness and sharpness in the old time wire centre calks.

Ring-Points must wear sharp because the inside wedge of steel wears slower than the shell. The Steel Point is forced forward—kept sharp and ready to grip and hold.

Only "Golden" Ring-Points have an anti-rust plating. It shines like gold—keeps rust away from the calks.

Don't let your horse slide into his grave for the sake of a few cents. I have "Golden" Ring-Points. You have the horse. Let's get together.

BILL JONES, Horseshoer

Rowe Calks, Hartford, Conn.

Get your coupons with your tobacco; put your calk money into quality goods that protect you. Don't sell your soul for a souvenir.



"When I put a shoe on a horse, I put my experience into the work—an' I've got t' get paid for my knowledge as well as for my work. And the shoes I use have got to back up both. That's why I use Champion Shoes."

CHAMPION SHOES

Made in a new, modern plant, equipped with the latest machinery.

Every man in the plant is an old, experienced horseshoe man.

The members of the company have had 30 years' experience in horse shoe manufacture. We know exactly what the horse shoer and the horse owner want, and we are making our shoes to fit all requirements. Ask your jobber.

Champion Horse Shoe Co.
PAWTUCKET, R.I.

C

C

AMERICAN BLACKSMITH

A Practical Journal of Blacksmithing and Wagonmaking

BUFFALO
N.Y. U.S.A.

DECEMBER, 1912

\$1.00 A YEAR
10c A COPY



**GOLDEN RUSTLESS
RING-POINT CALKS**
WITH WELDED TOOL
STEEL CENTERS
WEAR LONGEST, STAY SHARPEST
NEVER RUST IN THE SHOE

FOR SALE BY

**DONT LET THIS HAPPEN
TO YOUR HORSES**

**“GOLDEN”
RING-POINT
LANTERN
SLIDES
FREE TO
HORSESHOERS**

EVERYBODY goes to the moving picture shows. Farmers, truckmen, cabmen, laundrymen, liverymen—hundreds of horseowners drop in to see the pictures.

For a few cents a day you can advertise yourself and “Golden” Rustless Ring-Point Calks to all the people who attend picture shows. We’ll give you one or more lantern slides like the one shown above. You can arrange with the manager of any picture house to have the slides used during changes of reels.

The big ad. in three colors will be thrown on the curtain several times during every performance. Your name will appear in the picture as the agent for Ring-Point Calks. You’ll play before big audiences of horseowners. They’ll think of “Golden” Ring-Points during the show, after the show, and they’ll buy them from you next day. Let Ring-Point Lantern Slides smooth your way to more sales, more profit.

FILL IN AND MAIL THE COUPON AT ONCE

The Rowe Calk Company

Hartford, Conn.



“Golden” Rustless
Ring-Point Way

FILL THIS IN	TEAR IT OFF	MAIL TODAY
ROWE CALK COMPANY, HARTFORD, CONN.		Date _____
Please send to _____ (Name of Moving Picture Manager)		
at _____ (Manager's Address)		
FREE MOVING PICTURE SLIDE OF RING-POINT CALKS Which I desire to have used over my name as one of your local agents. It is agreed that I shall not be charged for Slide, and that no use will be made of it until the Moving Picture Manager has called upon me and arranged the details.		
Name _____		
Local Address _____		
State _____		



Old-Fashioned Wire-Pin
Way of Other Makers

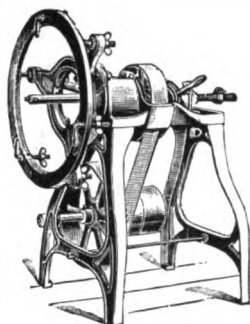


Fig. 708

Hub Boring Machine

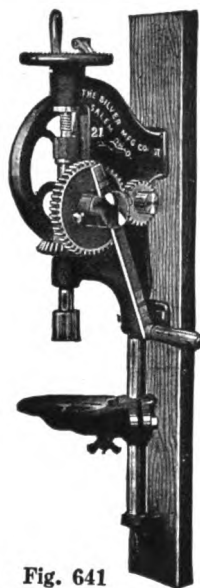


Fig. 641

No. 21 Hand Post Drill



Fig. 642

No. 22 For Hand Power

Made with Ball Bearings and Intermediate Gear. Fast or Slow Speed. Hand or Belt Power. Perfect Drills for work of all kinds.

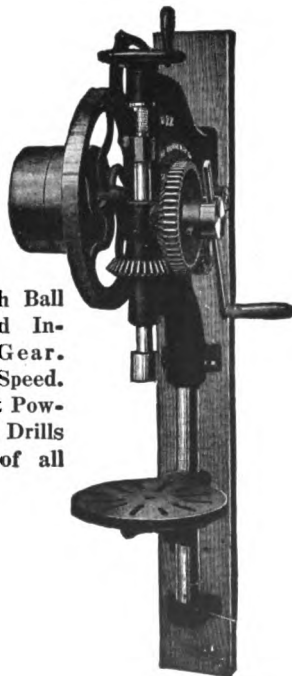


Fig. 644. No. 22.

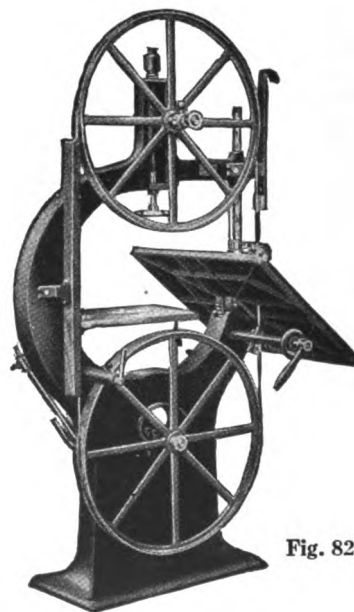


Fig. 822

Band Saw—Four Sizes

THE SILVER MFG. CO.

365 BROADWAY SALEM, OHIO.

Get one for Christmas Start the New Year Right

Boost your profits in 1913 by investing in some of these splendid money-saving machines.

Profit is what you are looking for, as much of it as you can get.

Let the "Silver" machines do your work for you—and you pocket the profits.

Be good to yourself this Christmas. Buy yourself a present—a "Silver" tool—and watch the pleasing results.

Insist on the "Silver" kind—don't take any other—then you'll have no cause for regret.

We wish you the Greetings of the Season, but we know they will be happier for both of us if you follow our suggestion and

SEND TODAY FOR MACHINERY CATALOG

or for any of the following booklets:

PORTABLE FORGES—Illustrating and describing 14 styles.

POWER DRILLS—Illustrating our line of 20" machines with lever feed, lever and wheel feed, power feed with automatic stop, power feed with back gears and automatic stop.

DRILLING MACHINES—Covering our new line of ball bearing post drills.

HUB BORING AND SPOKE TENONING MACHINES—Illustrating and describing several sizes of each.

BAND SAWS, JOINTERS AND SAW TABLES—Special loose leaves, illustrating and describing 20" Band Saws for foot or belt power or combination; 26, 32 and 36" power Band Saws with new features; also Saw Tables and five sizes of Jointers.

AMERICAN BLACKSMITH

A Practical Journal of Blacksmithing and Wagonmaking

BUFFALO
N.Y. U.S.A.

JANUARY, 1913

\$1.00 A YEAR
10c A COPY

The Rowe Calk Company Sued by the Government For Protecting Horseshoers

IMPORTANT! USE THIS ORDER BLANK FOR CALKS.

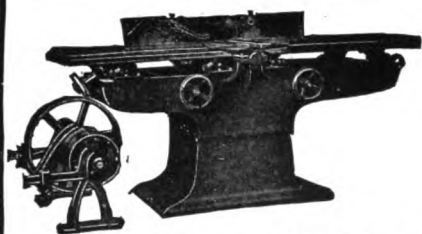
If you don't, you may not get what you want. Fill it out, sign it and mail it to your jobber.

Freight														
Ship me										by Express				
(Write time of shipment here)										(Write Routing here)				
SIZE	Round or Square	Ring Points	Rowe Juniors	Sharp Lock-Jaws	Blunt Lock-Jaws	H. Calks Square	Ring Point Pad Calks Square	Ring Point Racing Calks Square	Rowe Blunt Calks Square	Ring Point Drills 1/4-inch Shank	Ring Point Drills 3/8-inch Shank	Ring Point Hand Taps	Ring Point Machine Taps	Ring Point Stub Taps
5-16														
3-8														
7-16														
1-2														
9-16														
5-8														

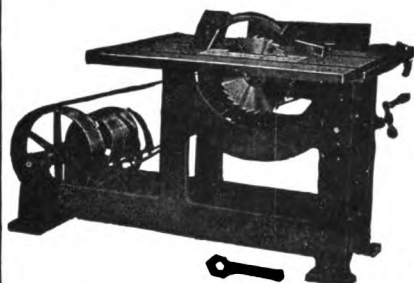
Ring-Point Iron Shoes

Size	F ⁰	H	F ¹	H	F ²	H	F ³	H	F ⁴	H	F ⁵	H	F ⁶	H	F ⁷	H	F ⁸	H
Drilled 100 lb. kegs																		
Blank 100 lb. kegs																		
Calked in boxes of 5 sets																		
Town and State																		
Date										Sign your full name here								

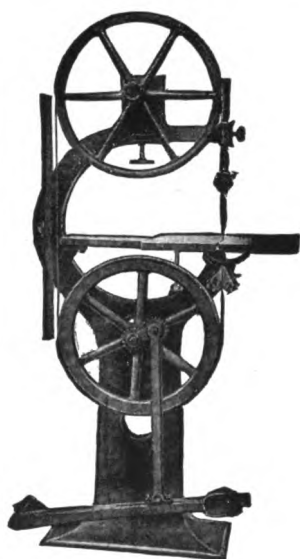
If you want Rowe Goods, don't say "Neverslip". Ask for RING-POINT Calks and RING POINT Drilled Iron Shoes or ROWE JUNIOR Calks, if you want them.

**SILVER'S NEW JOINTERS**

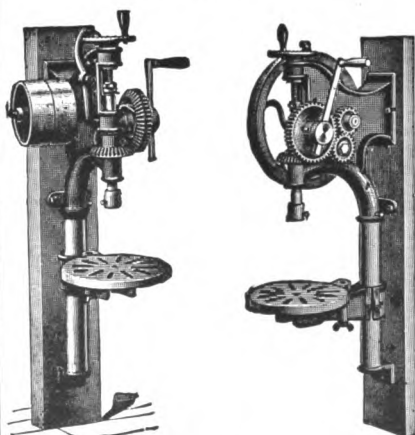
Five Sizes—8, 12, 16, 20 and 24 inch.
New "patent applied for" features.

**SILVER'S SAW TABLES**

Send for circular of Saw Tables and
Swing Saws.

**NEW PLANETARY BAND SAW**

20-inch Foot or Combination.



Our Booklet, "Drilling Machines," illustrates
several kinds we make.

Insist on Silver's Tools For Your Shop Economy.

The name "Silver" on any blacksmith tool is a guarantee of quality. Silver's Machines reduce your costs to a minimum. They have time and labor saving features that make smithing work easy.

Insist on Silver's Tools for your shop economy. Don't consider for a moment the purchase of new equipment until you secure our Machinery Catalog and prices. They will convince you that Silver's Tools are the machines for you to buy.

Bearing in mind that the blacksmith wants all the coin he can corral—that he wants to spend just what is necessary and no more, on tools and equipment—we have designed our machines in the most economical manner possible for retaining high quality.

Our Band Saws, Jointers and Saw Tables are the best that money and brains can build to sell at a moderate price.

Both Post and Power Drills are made from entirely new patterns throughout, and include improved features. They are simple, powerful and easy running. The general design is very neat and the finish excellent. Splendid for auto garages and repairing.

SEND TODAY FOR MACHINERY CATALOG

or for any of the following booklets:

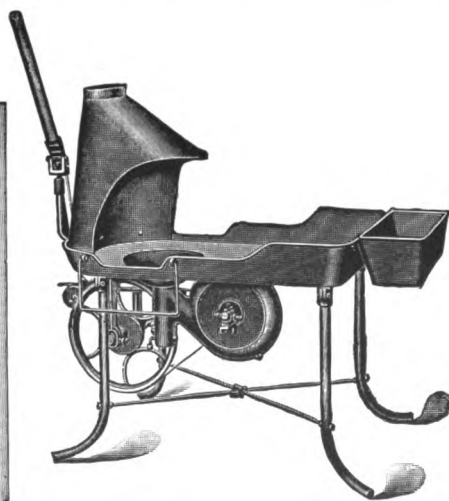
PORTABLE FORGES—Illustrating and describing 14 styles.

POWER DRILLS—Illustrating our line of 20" machines with lever feed, lever and wheel feed, power feed with automatic stop, power feed with back gears and automatic stop.

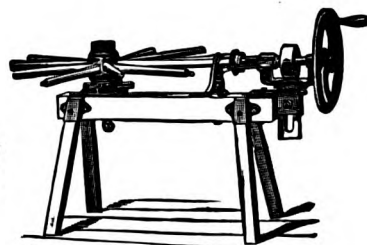
DRILLING MACHINES—Covering our new line of ball bearing post drills.

HUB BORING AND SPOKE TENONING MACHINES—Illustrating and describing several sizes of each.

BAND SAWS, JOINTERS AND SAW TABLES—Special loose leaves, illustrating and describing 20" Band Saws for foot or belt power or combination; 26, 32 and 36" power Band Saws with new features; also Saw Tables and five sizes of Jointers.



Our Portable Forge Booklet illustrates some **14**
kinds. We have a size to suit your needs.
Strong and durable. Attractive designs.

**SPOKE TENON MACHINES**

in Seven Sizes. Fitted with
Star Hollow Auger.

THE AMERICAN BLACKSMITH

A Practical Journal of Blacksmithing and Wagonmaking

BUFFALO
N.Y. U.S.A.

FEBRUARY, 1913

\$1.00 A YEAR
10c A COPY

Hello! You City Horseshoers.

Lock-Jaws Guaranteed Against Breaking

Common Fault in all Drive Calks Now Overcome

Famous Lock-Jaws Now Still Further Improved

No removable calk ever before jumped into instant favor as the LOCK-JAWS have done because no other calk ever had so many good ideas in it.

The making of these calks was not begun until September 1st, 1912. Yet Lock-Jaws are now used in every drive calk city from the Atlantic to the Pacific in quantities that have staggered the older manufactures.

The great locking feature simply preventing the falling out of the calks caught the calk users of every place.

Heretofore probably one-half of all the drive calks put into shoes have been lost on the streets.

Of no less importance has been the re-enforcement in Lock-Jaws of the edges on the wearing end.

Horseshoers everywhere have in former years found it difficult to remove worn drive calks because the corners would break off under the extractor.

Lock-Jaws cured these two evils and now have killed the third.

Drive calks have always been more or less brittle and many of them have broken off in use. This is because the steel has to be carried to a high heat in forging and afterwards chilled in water to harden the wearing end.

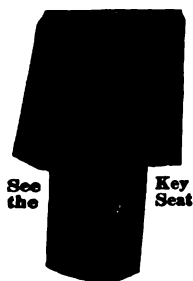
Lock-Jaws and all other drive calks therefore have always before had a certain percentage of brittle, breaking ones.

ALL THIS IS NOW OVER IN LOCK-JAWS; BUT NOT IN OTHERS.

Perhaps it may be overcome some day in other drive calks; but to-day Lock-Jaws are the only non-breaking drive calks and the only ones that any manufacturer dares to guarantee against breaking. We have learnt the secret; the others haven't.

If any horseshoer ever has any brittle or broken Lock-Jaws, it is only necessary for him to send them to us, charges collect and we will replace them immediately, prepaying the charges.

Do you know any other drive calk manufacturer who makes such an offer.



See
the

Key
Seat

Lock-Jaw
BackView

Key Calk Horse Shoe Mfg. Co.

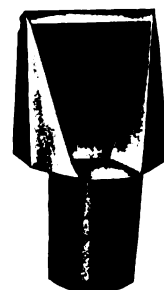
GREENBAY, WIS.

The Rowe Calk Company, Hartford, Conn.

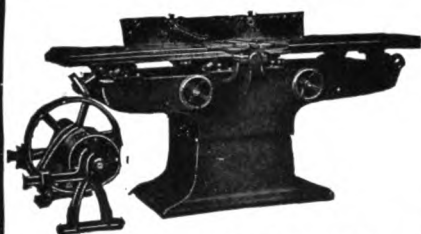
Exclusive Selling Agents.

LOCK-JAWS

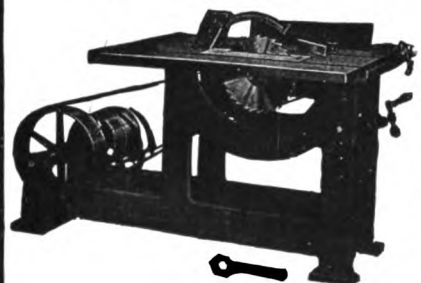
*Can't Fall Out. Corners Don't Break Under Extractor
Won't Break off In Use.*



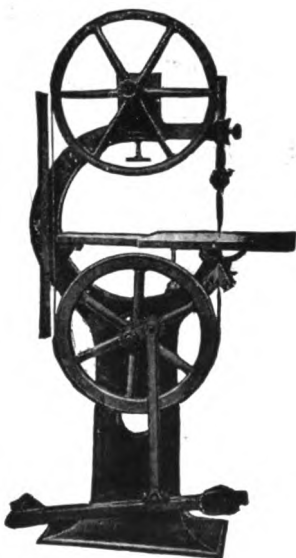
Front View of Lock-Jaw
Showing double re-en-
forcement of edges.

**SILVER'S NEW JOINTERS**

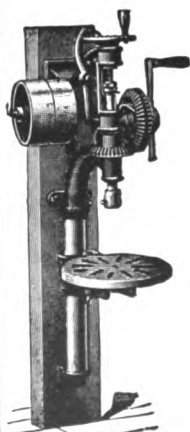
Five Sizes—8, 12, 16, 20 and 24 inch.
New "patent applied for" features.

**SILVER'S SAW TABLES**

Send for circular of Saw Tables and
Swing Saws.

**NEW PLANETARY BAND SAW**

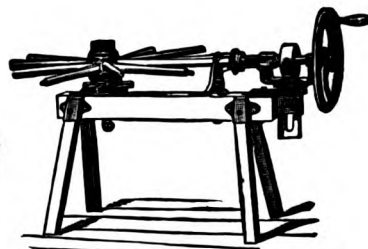
20-inch Foot or Combination.



Our Booklet, "Drilling Machines," illustrates
several kinds we make.



Our Portable Forge Booklet illustrates some 14
kinds. We have a size to suit your needs.
Strong and durable. Attractive designs.

**SPOKE TENON MACHINES**

in Seven Sizes. Fitted with
Star Hollow Auger.

THE SILVER MFG. CO.

365 BROADWAY

SALEM,
OHIO.**Smith Shop Economy
Demands Silver's Tools.**

Sharp competition demands economy in your shop methods. You can only charge so much for a certain piece of work. If your special tools and machinery enable you to turn out that work considerably cheaper than you could do by the old methods by hand, you have just so much more money in your jeans and you're just that much further ahead of your competitor.

If you can render quicker service in addition, you secure a well pleased customer, which is the best kind of advertising for bringing trade to your shop.

Silver's Forges, Drills, Carriage Makers' Tools and Wood Working Machines will earn more money for you because they have positive high grade quality and sell at a moderate price.

SEND TODAY FOR MACHINERY CATALOG

or for any of the following booklets:

PORTABLE FORGES—Illustrating and describing 14 styles.

POWER DRILLS—Illustrating our line of 20" machines with lever feed, lever and wheel feed, power feed with automatic stop, power feed with back gears and automatic stop.

DRILLING MACHINES—Covering our new line of ball bearing post drills.

HUB BORING AND SPOKE TENONING MACHINES—Illustrating and describing several sizes of each.

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THE

AMERICAN BLACKSMITH

A Practical Journal of Blacksmithing and Wagonmaking

BUFFALO
N.Y. U.S.A.

MARCH, 1913

\$1.00 A YEAR
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And Now For Spring!

CAT - FEET

Thirty Years Old in Europe

Great Success in America in 1912



As Worn, With Twisted Tar-Soaked Rope, Wearing Down No-Faster Than Iron Frame



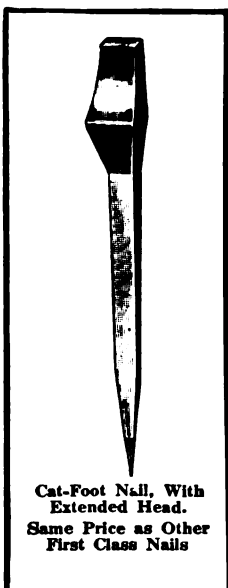
Half Worn, Showing Rope Filled With Concrete Surface of Sand and Pebbles



Bar Cat-Foots Have No Equal For Frog Pressure and Tender Feet



With Rope Removed For Heating Where Shoe Must Be Fitted



Cat-Foot Nail, With Extended Head. Same Price as Other First Class Nails

Driving out all others where Cushions and Non-Slipping Shoes are needed.

Far cheaper than Pads and Rubber Combination Shoes, and last as long.

In small towns where Pads have been too expensive, the Horseshoer can now sell the best of all Cushion Non-Slipping Shoes at a moderate price and get a good profit.

Always Fit Cold If You Can

CAUTION

Don't heat Cat-Foots above a Dark Red or they will burn. If burned they become soft and also are likely to crack.

DON'T CHILL IN WATER AFTER HEATING.
Watch Your Heat and You Won't Have Trouble.

Won't

Go

Stale on

Your

Hands

Like

Rubber

Now Order Your Spring Stock and be Ready for the Rush. Beat the Other Fellow

THE ROWE RING-POINT CO.

HARTFORD CONN.

Send \$1.10 for a sample set, any size, 0 to 4, by Parcel Post
Fully Guaranteed



THE SILVER MFG. CO.

365 BROADWAY SALEM, OHIO.

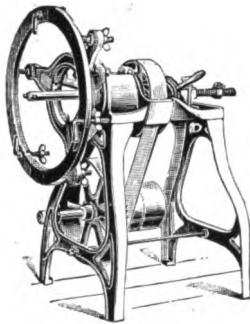


Fig. 708
Hub Boring Machine

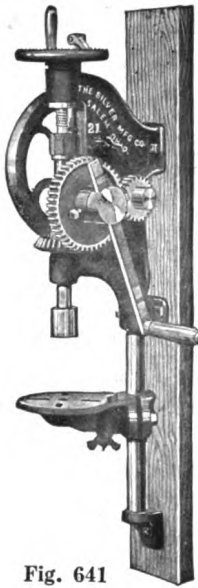


Fig. 641
No. 21 Hand Post Drill



Fig. 642

No. 22 For Hand Power

Graceful Serviceable Tools At Moderate Prices

Do not let your favorable impression end with your admiration for the graceful designs and neat lines of Silver's Tools. They possess in a high degree the ability to turn out high-grade work at minimum cost—to make money month after month for you. Wherever good honest construction at a low price appeals, Silver's tools are favorites. Adapted for auto garage work and repairing. Insist on the "Silver" kind—don't take any other—then you'll have no cause for regret.

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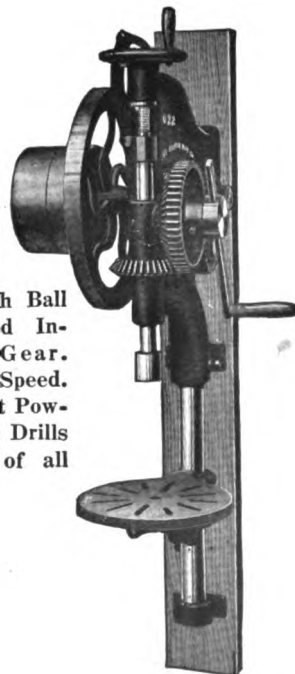


Fig. 644. No. 22.

Made with Ball Bearings and Intermediate Gear. Fast or Slow Speed. Hand or Belt Power. Perfect Drills for work of all kinds.

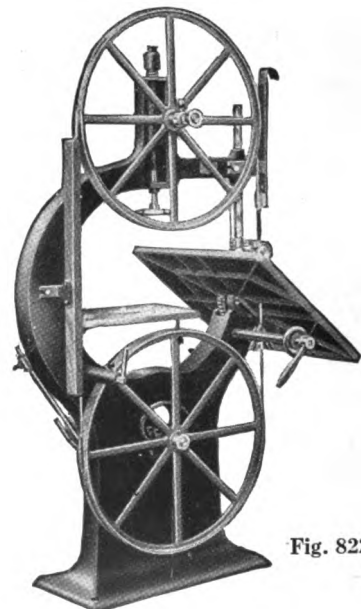


Fig. 822

Band Saw - Four Sizes

THE AMERICAN BLACKSMITH

A Practical Journal of Blacksmithing and Wagonmaking

BUFFALO
N.Y. U.S.A.

AUGUST, 1913

\$1.00 A YEAR
10c A COPY

Don't Gamble

Put Your Money On a Sure Thing

For Your Pocket's Sake Read This Now

Buy Rowe Calks and Drilled Shoes and
Lock-Jaw Calks and Shoes?

BECAUSE

1. You know that you will get your profits when you buy Rowe goods which are sold only to blacksmiths' supply houses.

2. The Rowe Calk Company has been tried out and always found fair to horseshoers.

3. The slick promises of salesmen for other lines are not carried out by the home offices, and the same old troubles continue just the same.

4. "Golden" Rustless Ring-Points are the best calks on earth inside and outside, last longer, wear sharper, won't fall out, don't break off and can't rust into shoes. See cuts below for reasons why.

5. Rowe Juniors wear longer and better than all other low-priced calks.

6. Lock-Jaws last longer than other drive calks, won't break, and can be locked into the shoe so that they won't fall out.

7. Rowe Calks are the only fully guaranteed calks on the market. Read guaranty on the circular in every carton of Ring-Points or ask us to mail it.

8. "Golden" Rustless Ring-Points are better and more widely known and advertised than any other calks. Everywhere admitted to be the best on the market.

9. Rowe Calks, because of their known superiority, will sell to your customers for more money than others. Send for special booklet on "How to Get Old Calk Profits."

10. The Rowe Calk Company advertises you and puts you side by side with other merchants.

Free "cuts" to run over your name in home papers, free split samples of Rowe Calks and competing kinds, free moving picture slides in colors over your name, free booklets bearing your name as agent mailed by us to your customers, free posters on your shop, and free stationery. Can you beat it?

Write us for full information about these free helps.

11. Horseshoers who use "Golden" Rustless Ring-Points help the free Ring-Point Benefit Fund for needy horseshoers and their families.

Write for particulars.

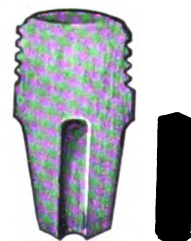
Address

ROWE CALKS, Hartford, Conn.

When you order calks, say Ring-Points, Rowe Juniors, Rowe Shoes and Lock-Jaws. Don't use words "Neverslip" or "Giant Grip" if you want Rowe goods. Send for our free order blanks for you to use in ordering from jobbers.



How "Golden" Rustless Ring-Points are made



Quick-wearing Fall-Out Wire Pin Calks of Other Manufacturers.



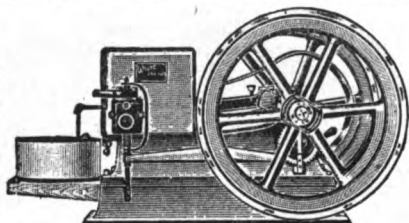
Get my Latest Engine Offer

Let a WITTE earn its cost before you pay for it. Take full 60 days' Free Trial and get the biggest engine value going.

Five Year Guaranty

I unqualifiedly guarantee every WITTE engine for five years against defects, and consequent faulty operation. I carry the risk, as I have done for my thousands of customers during 27 years.

Ed. H. WITTE.



WITTE Engines

Gasoline, Gas, Distillate, Kerosene.

All styles, 1½ to 40 H. P. Used and recommended by shop, mill, and factory men all over the earth. All my life I have been a shop man, making my own engines. I sell only what I make. That is why, for 27 years, WITTE engines have always made good, and stay good.

LOOK AT THESE PRICES!

4 H.-P., \$79.80; 6 H.-P., \$112.50; 8 H.-P., \$163.75; 11 H.-P. \$231.50

Other sizes proportionally low.

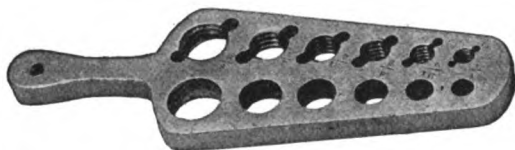
WRITE FOR MY FREE BOOK, and all about my New Liberal Offer, BEFORE you arrange to try any engine.

I save you money, besides giving you the easiest chance to get the best engine service. Write me to show you.

Ed. H. WITTE, WITTE IRON WORKS CO.

1769 Oakland Ave., Kansas City, Mo.

The First Idea of a Screw Plate was this



40 Years' Progress
Has Evolved This



The World's Standard
Now Used in 19 Different Languages

Write for book describing and pricing 130 different assortments of screw cutting tools.

WELLS BROTHERS COMPANY

GREENFIELD, MASS., U. S. A.



Champion Shoes

can now be obtained everywhere.

Write for special prices, giving us your dealer's name and mention this paper. We can save you money.

Quality of material is our specialty. Send for sample and the best horse shoe pin ever given away.

Champion Horse Shoe Co.

Pawtucket, R. I.





SEPTEMBER, 1913



THE AMERICAN BLACKSMITH



5



WATCH 'EM GROW



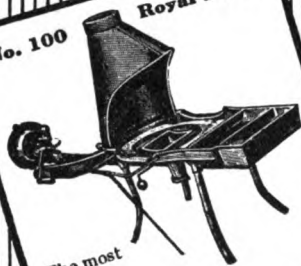
Phoenix Horse Shoe Company

Sales Offices:
CHICAGO

Rolling Mills and Factories:
POUGHKEEPSIE, N. Y., JOLIET, ILL.



No. 100 Royal Forge



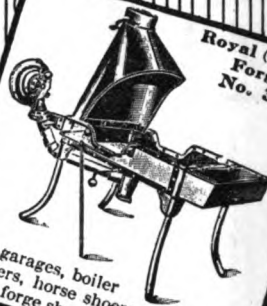
The most popular forge of to-day.

Western Chief Forge, Size XBB



For power shops, or where a forge for heavy work is desired.

Royal (Steel) Forge No. 37



For garages, boiler makers, horse shoers or any first-class forge shop.



Electric Blower No. 4 E

One fire variable speed blower.

When the Name

CANEDY-OTTO

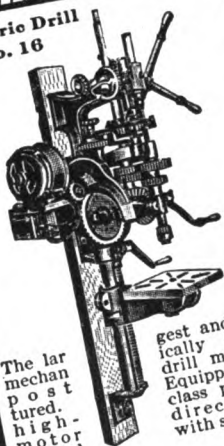
is found on a Forge Blower, Drill or any other Blacksmith Tool that is all the guarantee necessary

We Warrant All Articles of Our Manufacture

SOLD BY JOBBERS AND SUPPLY DEALERS EVERYWHERE

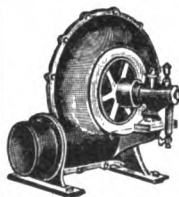
CANEDY-OTTO MFG.CO.
CHICAGO HEIGHTS, ILL. U.S.A.

Electric Drill No. 16



The largest mechanical post-tured, high-motor connected drive.

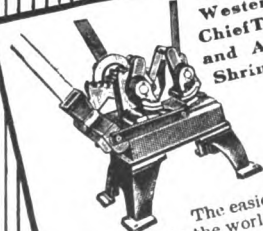
Best and most ideally perfect drill manufacture. Equipped with class powerful directly connected spur gear



Power Blower

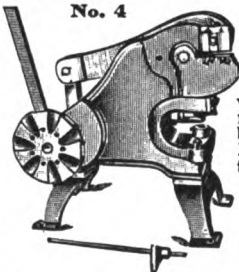
Made in 5 sizes. Adapted to forge fires and light Cupola work. Built for service.

No. 1½ Western Chief Tire and Axle Shrinker



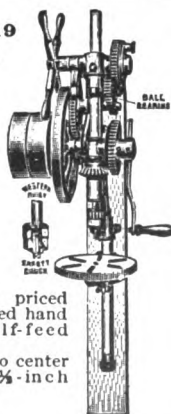
The easiest operated shrinker in the world.

Combination Punch and Shear No. 4



It can be operated toward the front or back. Depth of throat 6 inches.

No. 19 Drill



A low priced combined hand and self-feed drill. Drills to center of 16½-inch circle.

Royal H. Blower

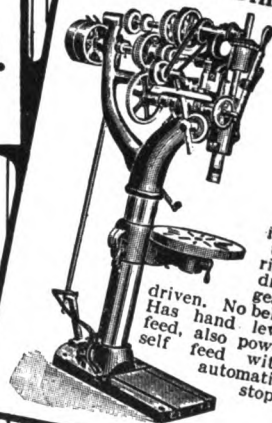
Fire Pot 8x9½x4 in. inside.

The successful blower.



Spur gears used only. Ask the man who owns one.

No. 31 Drill



20-inch upright drill gear driven. No belts. Has hand lever self feed with automatic stop.

COUPON

CANEDY-OTTO MFG. CO.,
Chicago Heights, Ill.

Gentlemen:

Please send me a free copy of your 160-page Tool Catalogue.

Name _____

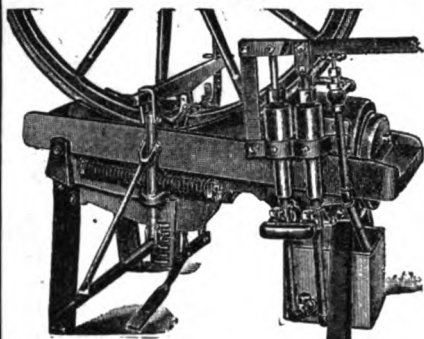
P. O. Address _____

State _____

Give name of your jobber or supply dealer here _____



House Hydraulic Cold Tire Setter



IS A GREAT SUCCESS

It does the work perfectly.

It is the only edge grip hydraulic setter having the heads move with the circle of the wheel, which prevents the tire from kinking or flattening.

Write for full particulars

HOUSE COLD TIRE SETTER COMPANY
220 S. Third Street ST. LOUIS, MO.

"NEW EASY"

4 Sizes

BOLT CLIPPERS

"EASY"

2 Sizes

THE GENUINE TOOL



KNOWN AND
PREFERRED
EVERYWHERE

H. K. PORTER

EVERETT, MASS.

U. S. A.

Stamped
With Your
Own Name in
\$5.00 Assortments.

We sell by mail only, and to only one smith in each town. Every knife warranted. Write for information and send for catalog.

WOODWORTH KNIFE WORKS, Nunda, N. Y.

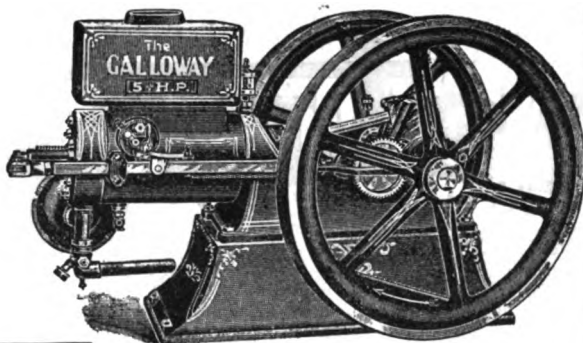
BUTCHER KNIVES MADE FOR BLACKSMITHS



2½ to 15

H. P.

Stationary or
Portable



WANTED:

TO hear at once from every man who reads the American Blacksmith. I have a book to send which will solve most of your questions as to what kind of power you ought to have in your shop. It is one of the most complete engine books issued at this time. It is full of facts about power that every blacksmith ought to know.

The book has 64 pages, beautifully printed, illustrated with many photographs showing Galloway engines in actual operation. The book is sent absolutely free. You have only to ask for it. If you haven't an engine in your shop write for the book today and I will tell you about the Galloway engine, what it is, what it can do and what it costs. I will show you how you can increase your capacity, how you can handle the big automobile and farm machinery jobs that now you have to turn down. I can show you how you can do more work at a lower cost and better work than you have ever been able to do.

Write for the book Today

THE WILLIAM GALLOWAY COMPANY, 575 A. B. Galloway Station
WATERLOO, IOWA

THE "ATLAS" Belt Driven Forging Hammer

For General and Repetition Forgings



Four
Unbeatable
Features:

1. Simplicity
2. Durability
3. Economy of Working
4. Price

Three Sizes—
60, 100, 160 lbs.

Illustration
of 60 lbs.
Power
Hammer

JOHN SPENCER & CO.

(Keighley, Limited)

KEIGHLEY, ENGLAND

"GEARS AND WAGONS"

Selle Gears

A quarter of a century of success has placed "Selle Gears" and Wagons in the

hands of the largest wagon users in the world. Express and Transfer Companies, Department Stores, Fire Departments, etc., specify "Selle Gears" and will take no other after once tried.

280 page catalog free.

THE AKRON-SELLE CO.

Akron, Ohio



WEST'S CARRIAGE AND
AUTOMOBILE TOP DRESS-
INGS. For rubber, leather, and
imitation leathers. Preserves all
tops permanently. Will not get
brittle or crackle. Finish equal
to new top.

Send for Sample.

West Mfg. Co., Rockford, Ill.

The Perfect Power Hammer



Note the difference in construction over other makes.

Extra Long Guides, insuring a direct movement of the ram without any side motion, which causes guides and springs to break on other hammers.

The only Hammer made with a disk attachment with special anvil for sharpening harrow and plow disks.

A recently invented Friction Clutch fitted with Ball Bearings absolutely controls the operation of the Hammer by foot pressure from the lightest tap to the heaviest blow. This ease of operation makes the hammer particularly well adapted for plow work, as you can get as light a stroke as you desire.

Will ship to any responsible party on approval. If not as represented, no sale.

Made in Two Sizes:

3 inch square, 40 lb. ram—

shipping weight, 1,150 lbs.

4 inch square, 80 lb. ram—

shipping weight, 1,800 lbs.

Write any Jobber for
Prices, or

MACGOWAN & FINIGAN
FOUNDRY & MACHINE CO.

204 North Third Street
ST. LOUIS, MO.



STAR STEEL SHAPES



Use "Star" Quick Repair Shares For Fall Work

They are made 12 in., 14 in., 16 in. and 18 in.
Right and Left Hand, in solid cast, crucible or soft
center steel, $\frac{1}{4}$ in. or $\frac{5}{16}$ in. thick.

Your jobber will supply them.

Star Manufacturing Company
Carpentersville, Ill.



Never burn off old paint and varnish
again on a refinishing job.

"KRAKNO"

has made burning off entirely unnecessary

KRAKNO is the Johnston surfacer and filler that has caused the biggest stir in years in the carriage and automobile business because it really does fill all cracks in old paint and varnish—keeps them filled permanently and forms a perfect base for the finest colors and varnishes.

There now you have the whole story. The paragraph above tells you everything. We might make it longer but we couldn't make it stronger.

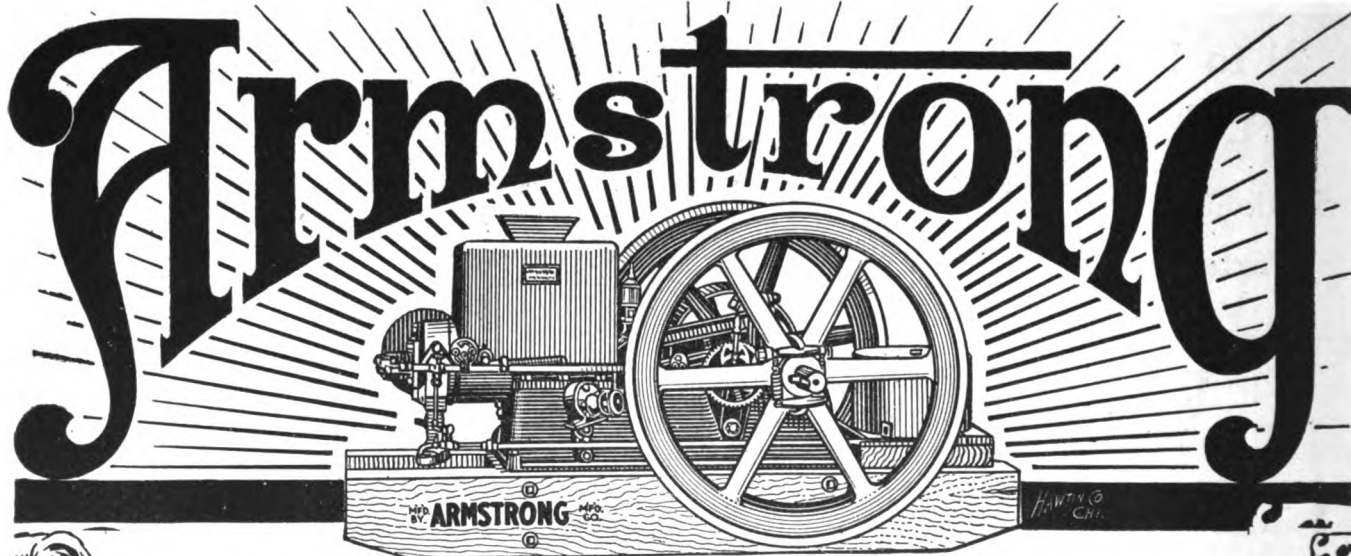
Order One Gallon on Trial

We will tell you just how to use it. If KRAKNO makes good for you, you will have made a valuable discovery. If it does not we expect you to shoot it right back to us at our expense and get a refund.

Price \$3.50 per gallon.

The R. F. Johnston Paint Co.

Pearl and Main Sts. - Cincinnati, Ohio



The Kind of Engine You Want and Need in Your Shop

AN ENGINE that is built for long hard service; that is economical in cost and up-keep; that will properly operate every machine in your shop; that will run smooth, steady and quiet, day in and day out, with no trouble or care;—that is what the Armstrong Engine will do. More than forty-five years of successful manufacturing experience is behind every Armstrong Engine, and the written guarantee we give you is protection and security of unequalled quality.

A TROUBLE-PROOF MAGNETO, FREE

Another important feature is the magneto furnished with all Armstrong Engines, and this combined with silent running wear-and-tear saving roller valve gears—invented and patented by us to double the efficiency of our engine, as well as many other advantages, justifies our claim that the Armstrong Engine is in a class by itself.

Let Us Send You Full Details and Facts. Just drop us a line, a post card will do, and say "SEND ARMSTRONG FACTS." We will tell you all about the engine built for hard service.

ARMSTRONG MFG. CO.

1651 Chestnut Street

WATERLOO, IA.



SEPTEMBER, 1913



THE AMERICAN BLACKSMITH



9



FEDERAL Horse Shoe PADS



YOU can build up a permanent and profitable business by recommending to your customers the use of Federal Horse Shoe Pads.

Federal Horse Shoe Pads are exceptional in quality and durability. They are made of live rubber, full shaped, with large resilient heel which affords full protection against shock of hard service, and prevents slipping on pavements.

If not procurable through your regular supply house, write for booklet and prices.

To the Jobber

We have an especially interesting proposition to offer on Horse Shoe Pads, either in our regular or special brands, and in Leather, Canvas, or Composition Back. Let us estimate on your requirements for 1914.

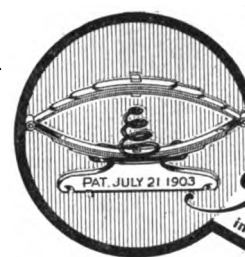
**FEDERAL RUBBER
MANUFACTURING COMPANY**
Milwaukee

Branches and Agencies in all Principal Cities

Blacksmiths Make Big Money

Fitting Wagons with Coil Spring Buffers

Almost every spring wagon that comes to your shop needs Victor Buffers. You can fit out these wagons with very little talk, and pocket a nice profit. You'll soon work up a good business on them.



VICTOR Coil Spring BUFFERS

will double carrying capacity of carriage and wagon springs. Positively prevent breaking springs—save their cost in this way alone.

Victor Coil Spring Buffers give light, easy riding; resilient spring for light loads; strong spring for heaviest loads—saving jarring and jolting.

Victor Coil Spring Buffers

For Sale by All Jobbers

Order Victor Coil Spring Buffers from your jobber at once. All sizes, to fit either elliptical or platform springs. Easily and quickly attached without bolts or straps. Never work loose. If your Jobber can't supply you, write us.

Indianapolis Bolster Spring Co.
Dept. 513 Indianapolis, Ind.

Increase the Earnings of your Shop

with a Reliable Power Hammer

The New Little Giant is such a hammer. This fact is being testified to by over 4,000 satisfied users. Built for hard service out of the best materials by the most skillful mechanics.

The New Little Giant will stand the test of long years of continuous hard work.

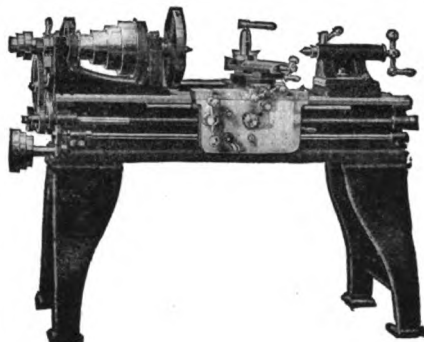
Write now for price and particulars to your Jobber or the Manufacturers.

Mayer Bros. Company

Mankato, Minnesota.



Sebastian Lathes



Modern—Practical—High Grade—Low Price

The Sebastian Lathe Company
124-126 Culvert St. Cincinnati, Ohio

**A \$100.00 Power Hammer
For \$60.00**

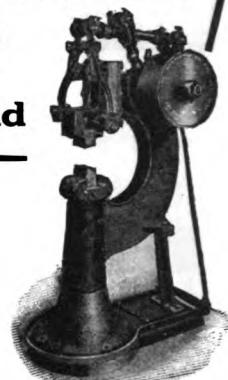
For Blacksmiths and Manufacturers _____

**Write for full
particulars**

The Kerrihard Co.

Red Oak P. O. Box 423 Iowa

Factory doubled this year



If not the best hammer you have ever used, return at our expense. We have never had a Modern returned as unsatisfactory.

Write for Circular showing the New Modern.

Agents for U. S. A.: ALL JOBBERS.

Agents for Canada:

D. ACKLAND & SON, Ltd., Winnipeg, Can.

Agents for Australia:

**GIBSON, BATTLE CO., Ltd., Melbourne
and Sydney.**

**Agent for Montevideo-Uruguay, Caso en Pando:
AMBROSIA BERTOLOTTI.**

MODERN SALES CO., Hampton, Ia., U.S.A.

INSIST ON "STANDARD" CALKS



**BUY
FROM
YOUR
DEALER**

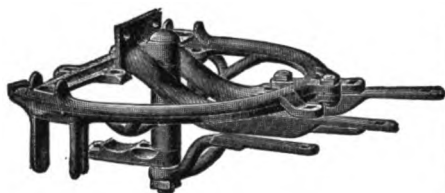
FRANKLIN STEEL WORKS

Joliet, Ill.
Cambridge,
Mass.

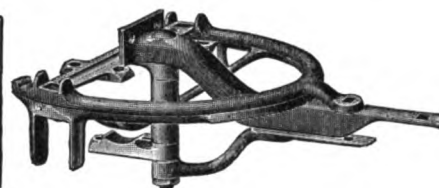


How to order Dayton Fifth Wheels of your Jobber, and be sure of the right size.

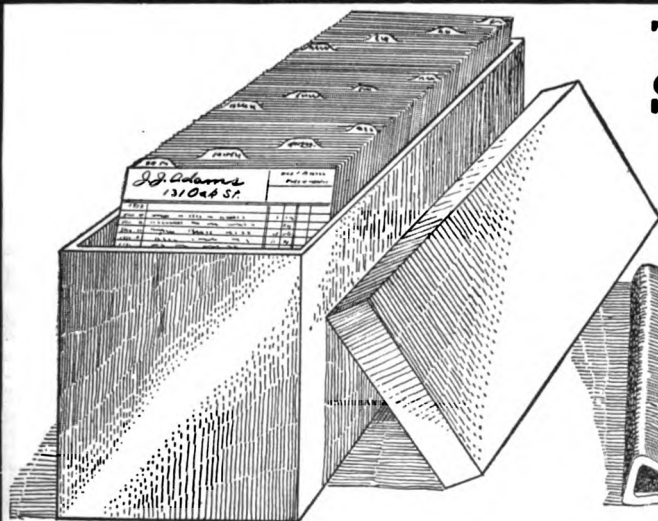
No. 440B 10 inch Diameter DOUBLE REACH	For two Passenger Buggy with one-inch Straight Axles Plain Axle? Swaged Axle?	No. 440E 12 inch Diameter DOUBLE REACH	For four passenger Vehicles with 1½ inch Straight Axles Plain Axle? Swaged Axle?
No. 441B 10 inch Diameter SINGLE REACH	For two Passenger Buggy with one-inch Straight Axles Plain Axle? Swaged Axle?	No. 441E 12 inch Diameter SINGLE REACH	Four four Passenger Vehicles with 1½ inch Straight Axles Plain Axle? Swaged Axle?
No. 440C 10 inch Diameter DOUBLE REACH	For two Passenger Buggy with one-inch Fantail Axles Plain Axle? Swaged Axle?	No. 440D 12 inch Diameter DOUBLE REACH	For four passenger Vehicles with 1½ inch Fantail Axles Plain Axle? Swaged Axle?
No. 441C 10 inch Diameter SINGLE REACH	For two Passenger Buggy with one-inch Fantail Axles Plain Axle? Swaged Axle?	No. 441D 12 inch Diameter SINGLE REACH	For four passenger Vehicles with 1½ inch Fantail Axles Plain Axle? Swaged Axle?



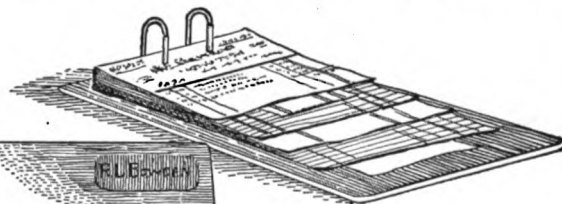
Do not cut out the illustrations. Write to your jobber on your own letterhead, giving the number and letter of each size you want. The numbers and descriptions are grouped above for your guidance in selecting them correctly. Always write whether you want them for Plain Axle or Swaged Axle.



The Dayton Malleable Iron Co. Dayton, Ohio



THE RALPH BOWDEN SMITHSHOP SYSTEM



\$5.⁵⁰

A Simple Smithshop System of Bookkeeping at a surprisingly small price.

We are now ready to fill orders for the Bowden Outfit. Here's what you get for \$5.50

One index card holder of tin—neatly finished with two flap covers (not as shown in cut)—to hold 500 cards 5 x 8 inches in size.

500 cards—5 x 8 inches—ruled and ready for use.

One double wire arch file for filing invoices and statements.

One loose-leaf binder to hold 200 sheets 5 x 8 inches in size; 200 sheets—ruled—5 x 8 inches in size.

This is the outfit Mr. Bowden explained and described in the June issue. And all it costs you is \$5.50 or 1£ 6 sh.

AMERICAN BLACKSMITH CO. Box 974, BUFFALO, N. Y., U. S. A.



TRADE LITERATURE AND NOTES

THE BURLINGTON WATCH CO., whose advertisement appears on another page of this issue, are making a special offer to our readers on watches. They tell us by their method of selling, it is possible to sell the Burlington Watch, which compares favorably with those on the market at \$65 and \$70, for less than half of this price.



They also tell us about talking to a man the other day who had carried a "Burlington Special" for about six months. He had given the watch the hardest kind of use as he is a structural steel worker. He explained that he had not set the watch since the day it arrived direct from the Burlington Watch Factory, and when he compared it with the chronometer in a neighboring jewelry store, we found it had gained a half a minute. This record is certainly remarkable and shows the absolute reliability of these watches.

And, besides being an exceptional time-keeper, the Burlington Watch is very handsome. This company have a large assortment of cases that the purchaser can select from.



The remarkable growth of the Burlington Watch Co. is the best evidence of the success of their means of selling high-grade watches direct from the factory

to the user. They are now issuing a book explaining all about contracts with dealers which makes the ordinary method of selling watches so difficult. In this book is explained exactly the troubles that the new watch companies have in introducing their products and tells of some of the unfair trade conditions with which they are forced to contend. They also explain how the "Burlington Special" is made and why they can guarantee it FOREVER.

A postcard with your name and address to the Burlington Watch Co., Chicago, Ill., will bring you this free.

SEARS ROEBUCK & CO. have sent us their special Catalog, in which they describe their very complete line of Screw Cutting Engine Lathes.

They mention that many thousands of these lathes are being used in blacksmith shops, garages, manufacturing plants and other places where heavy, rigid, powerful and accurate lathes are needed.

A liberal trial offer on lathes and other tools will be given to any prospective buyer. By this offer you can try a lathe in your shop for 30 days, and if it does not prove satisfactory in every way, you can return it and your money will be refunded.

A copy of the above-mentioned catalog will be sent to any AMERICAN BLACKSMITH reader on request. Write Sears, Roebuck & Co., Chicago Ill., and request Catalog No. 60A16.

WE WANT TO CALL our readers' attention to the advertisement of Ludvigsen Bros., Jackson, Minn. the advertisement of Ludvigsen Bros., Jackson, Minn., which appears on another page of this issue. These people have used space with us a number of years to advertise their Welded Steel Center To Calks, which we understand are giving excellent satisfaction to their many users.

They are self-sharpening calks; the hard steel plate in the center and the two outside soft iron plates are welded together and shaped to a sharp calk.

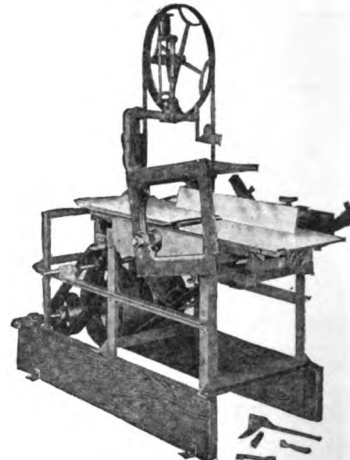
Ludvigsen Brothers will be very glad indeed to send a sample of their calks to any reader of the AMERICAN BLACKSMITH on request. You can address them either at Jackson, Minn., or 47 Second St., Milwaukee, Wis.

THE PHILLIPS-LAFFITTE CO. of Philadelphia, Pa., have recently published a new illustrated folder giving directions for the use of Laffitte Welding Plates. The folder describes how many difficult jobs can be easily and quickly done and our readers should write for a copy of this interesting circular.

Most of our readers are acquainted with the merits of Laffitte Plates for welding at a low heat, giving splendid results with a saving of time, fuel and material. If you have never tried Laffitte Plates, write at once for a free sample to Phillips-Laffitte Co., Philadelphia, Pa.

THE MACHINE ILLUSTRATED in the cut is one of the new machines shown in the new catalog of the Parks Ball Bearing Machine Co., Cincinnati, Ohio, and is especially adapted for the wagon shop that is crowded and every inch of space must be utilized. Many wagon shop owners do not feel able to purchase a double spindle shaper and the new machine will appeal to many who are looking for a cheap serviceable combination that is compact and does not require much space. The double ended mandrel takes the place of the double spindle shaper, the only difference being that the material is handled perpendicularly instead of horizontally and passing from one side to the other as the grain of the wood requires instead of going from one spindle to another. By having a cutter on each of mandrel exactly the same shape, circular moulding, rim rounding, rabbetting, inside panel work, etc., can be done, gauging from face side of material, and the same results are obtained as on a double spindle shaper. The machine is furnished in either light or heavy sizes with either 6 or 12 inch jointer, or 36 inch band saw can be substituted for the 22-inch. The steel plates of the jointer are either 6 or 12 inches wide;

the one in front of the cutter head being 2 feet long and the one in the rear 2½ feet long; both are ground to a true and finished surface and both have hand wheel adjustment to raise and lower on inclines in perfect alignment to adjust depth of cut and can be slid to and from cutter head. Plates being of



steel can be made much thinner in front and rear of cutter head than cast iron will stand. This allows the plates to come as close together as possible to make. The front plate has an extension on the left side beyond the cutter head, and rear plate has an adjustable drop surface on left side in line with end of head, adapted for rabbetting on the end of jointer head, and with this adjustable surface you have a support for material when cutting any depth rabbet desired. The head is four-sided and held in plate with key and set screw and has slotted knives on two sides and the other two sides are drilled with screw holes to receive moulding knives which can be added to jointer head and used without taking the straight knives off the head. The band saw shown has a 22 inch swing, both upper and lower wheels being 22 inches in diameter with 1½-inch face fitted with endless rubberbands, ground true for the saw to run on. The upper wheel has a tilting adjustment on top bar for leading saw with proper tension against the guide, which is a very desirable feature. There is also a hand wheel for regulating the tension on saw which also serves to lower the upper wheel to accommodate shorter saws. The tilting table of the band saw is made of cast iron planed true and 14½ inches x 17½ inches and on machine shown is 40 inches from the floor. The ball bearing guide runs as easily as it is possible to make it to prevent saws from breaking. The upper guide can be raised to saw material up to 6½ inches in thickness.

HAVE YOU ANY FRIENDS

in the smithing craft whose good will you especially esteem? There is no better way of showing them your friendship than by a small gift; there is no gift which such a friend would appreciate more than a year's subscription to The American Blacksmith. It will remind him of you constantly for an entire year, and furnish him with interesting, valuable reading which he will greatly like. If you have any friends who are not subscribers, write us for terms of subscriptions for them.

AMERICAN BLACKSMITH CO.
P. O. Box 974, BUFFALO, N. Y., U.S.A.



NOTICE—We manufacture everything, from a Tack to a Complete Vehicle.

AUTO TOPS AND SUPPLIES

Write for 1913 Catalogue

WE CAN SAVE YOU MONEY

BUOB & SCHEU

No. 498 Court Street

CINCINNATI, OHIO



SEPTEMBER, 1913



THE AMERICAN BLACKSMITH



13



GET IT ON TRIAL—SEND NO MONEY

WHAT THE BLACKSMITH AND WAGON MAKER THINK OF THE FAMOUS No. 14

Jno. F. Laura, Coldwater, Mich.—“I had a (***) and others on trial; nothing but the Famous filled the bill.”

Victor Ovenden, Pompeii, Mich.—“Does everything claimed for it—and then some more; the work it will do is limited only by one's own ability and genius.”

C. W. Smith, Hot Springs, Ark.—“It sure does the work; none better at any price.”

Dad Boyle, Amarillo, Texas.—“Small Plant—Lots of work—Little expense.”

W. N. Eisele, New Berlin, Ill.—“Don't know how I could get along without it.”

Fennel Carriage and Wagon Works, Moberly, Mo.—“Certainly does the work; can't say too much for it.”

W. H. Schmedlen, Coldwater, Mich.—“Requires little power and room, very compact, well made and efficient; a big value for the money.”

Nick Jenney, Berne, Ind.—“Greatest labor and time saver I ever saw in a wagon shop.”

M. J. McClure, Corsicana, Texas.—“Don't see how I could run my shop without it.”

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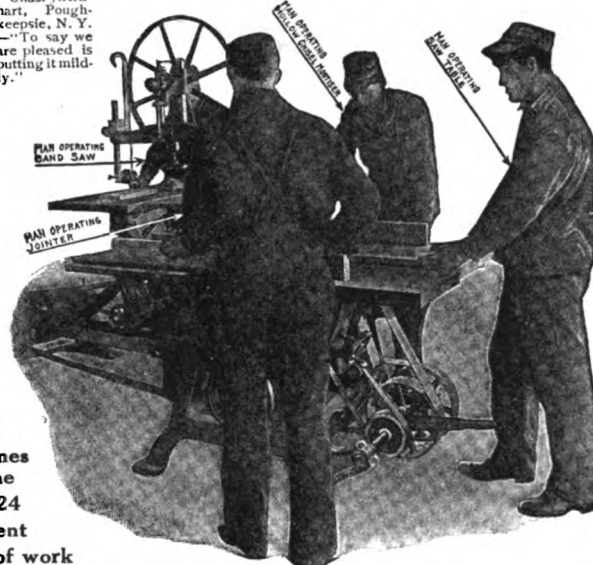
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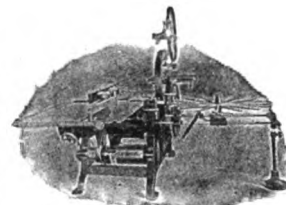


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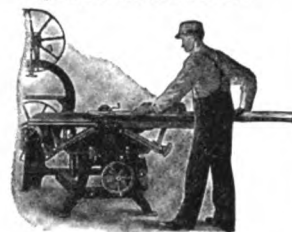


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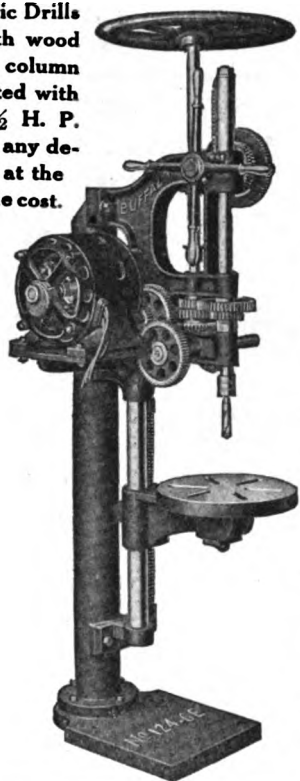
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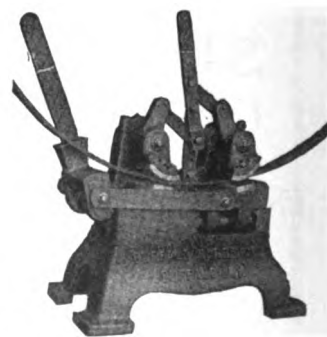
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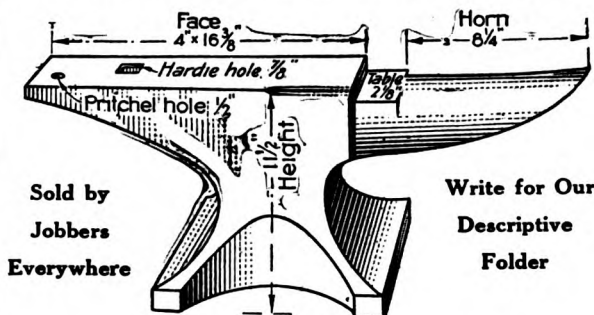
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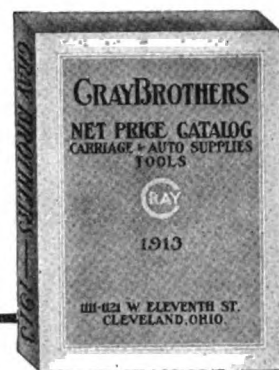
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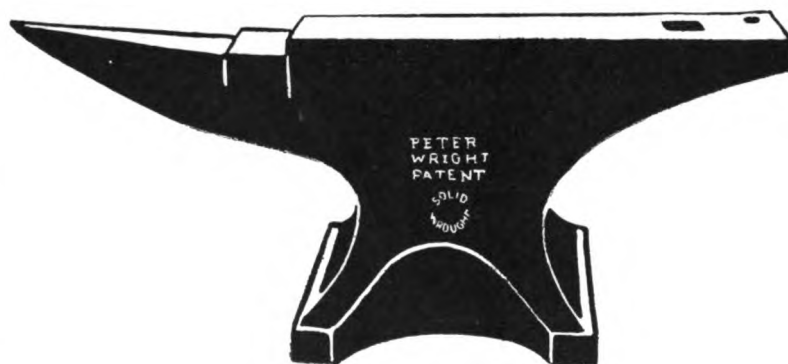
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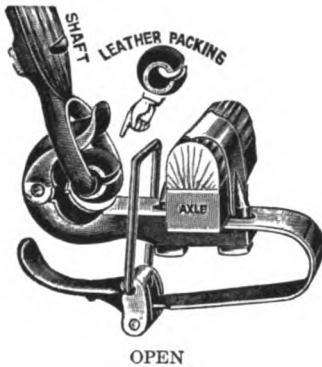
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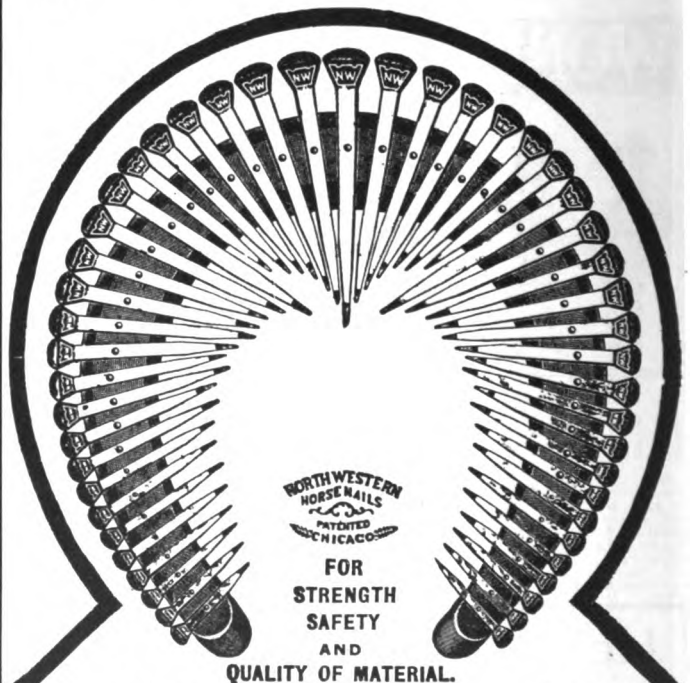
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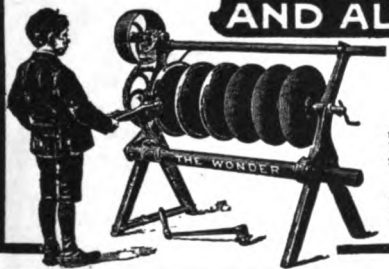
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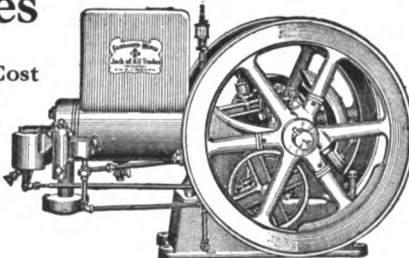
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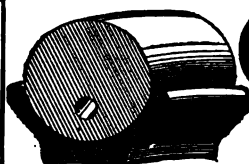
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WOOD and STEEL FARM TRUCKS
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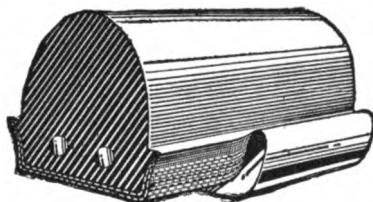
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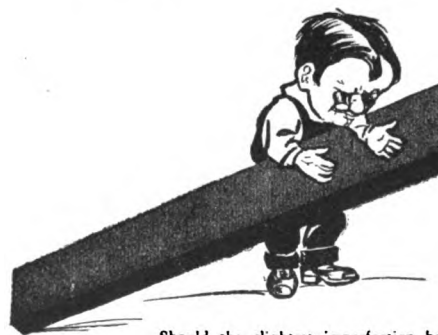
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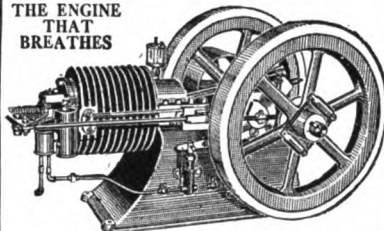
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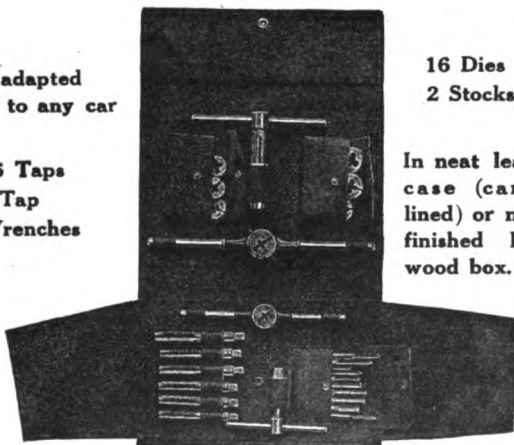
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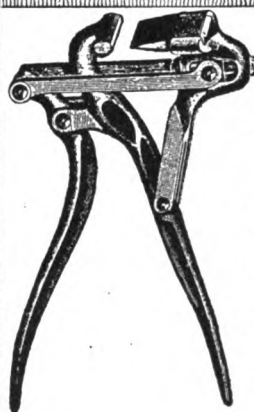


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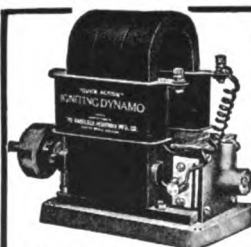
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Cray Brothers.	15	Disc and Plow Sharpeners		Muncie Wheel Co.	35
		A. E. Durner.	17		
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Cray Bros.	15	Strite Governor Pulley Co.	51	American Horseshoe Co.	41
				Bryden Horseshoe Co.	49
Blowers, Hand		Drilling Machines, Hand and Power		Champion Horse Shoe Co.	4
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Canedy-Otto Mfg. Co.	6	Canedy-Otto Mfg. Co.	6	Rhode Island Perkins Horseshoe Co.	3
Champion Blower & Forge Co.	40	Champion Blower & Forge Co.	40	U. S. Horseshoe Co.	42
		Cleveland Twist Drill Co.	17		
Blowers, Electric		Millers Falls Co.	33	Horseshoe Nails	
Buffalo Forge Co.	14	Silver Mfg. Co.	2	Capewell Horse Nail Co.	52
Canedy-Otto Mfg. Co.	6			Union Horse Nail Co.	16
Champion Blower & Forge Co.	40	Drilling Machines, Electric			
Electric Blower Co.	46	Buffalo Forge Co.	14	Horseshoe Pads	
Roth Bros. & Co.	17	Champion Blower & Forge Co.	40	Federal Rubber Mfg. Co.	9
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H. K. Porter.	7	Kerrihard Company.	10	Barcus Mfg. Co.	43
Wiley & Russell Mfg. Co.	35	Crescent Machine Co.	47		
				Hub Borers	
Brazing Compound		Engines, Gas and Gasoline		Silver Mfg. Co.	2
Phillips-Lafitte Co.	37	Armstrong Mfg. Co.	8		
		Ellis Engine Co.	46	Iron	
Calks		Fairbanks, Morse Co.	17	Beals & Co.	37
American Calk Co.	52	Gade Bros. Mfg. Co.	35	Bourne Fuller Co.	16
Champion Horse Shoe Co.	4	The Wm. Galloway Co.	7	Milton Mfg. Co.	36
Franklin Steel Works.	10	International Harvester Co.	17		
Giant Grip Horse Shoe Co.	48	Witte Iron Works.	4	Jobbers	
Ludvigsen Bros.	34			Campbell Iron Co.	36
Phoenix Horseshoe Co.	5	Engines, Kerosene		Cray Bros.	15
Rhode Island Perkins Horseshoe Co.	3	Fairbanks, Morse & Co.	17	Cummings & Emerson.	38
Rowe Calk Co.	1				
		Fifth Wheels		Lathes	
Calking Machines		Dayten Malleable Iron Co.	11	Sears, Roebuck & Co.	45
L. S. P. Calking Machine Co.	51			Sebastian Lathe Co.	10
		Files and Rasps			
Carriage Parts		Heller Bros. Co.	46	Lighting Systems	
A Wheel Top & Hdw. Co.	44	Nicholson File Co.	18	Brilliant Gas Lamp Co.	46
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Cray Bros.	15	Forge Chimneys		Magnets	
Fisher & Metzger.	46	Lourie Mfg. Co.	52	Knoblock-Heideman Mfg. Co.	36
Ind. Top & Vehicle Co.	36				
West Mfg. Co.	7	Forges			
		Buffalo Forge Co.	14		
Chucks		Canedy-Otto Mfg. Co.	6		
Buffalo Forge Co.	14	Champion Blower & Forge Co.	40		
Canedy-Otto Mfg. Co.	6	Silver Mfg. Co.	2		
Champion Blower & Forge Co.	40				
Goodell Mfg. Co.	46	Gears			
		Akron Sells Co.	7		

When you write to advertisers in reference to anything advertised here, please mention The American Blacksmith.

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SAVE ALL FIGURING!

Tell at a glance how much stock to use for oval, elliptical, hoops of any size, the circumference of circles, weight of flat, square and round stock, and the weight and strength of ropes and chains. Should be in every progressive Smith's hands. Bound very neatly in green cloth. Price, 50c. AMERICAN BLACKSMITH COMPANY, Buffalo, N.Y.

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—MADE BY—

The Milton Mfg. Company,

MILTON, PENN'A.

Is of Superior Strength and Quality. We can prove it. Write us.

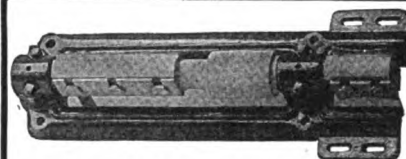


Paints	Page	Spoke Machines	Page	Twist Drills	Page
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Punches		Butterfield & Co.....	43	Columbian Hardware Co.....	33
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Bertsch & Co.....	38	Champion Blower & Forge Co.....	40	Millers Falls Co.....	33
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				Chas. E. Miller.....	17
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		Sidney Tool Co.....	13	Anti-Borax Compound Co.....	49
Saws, Band		Silver Mfg. Co.....	2	Cortland Welding Compound Co.....	46
Creascent Machine Co.....	47			Phillips-Laffitte Co.....	37
Sidney Tool Co.....	13	Tire Heaters		Welding Plates	
Silver Mfg. Co.....	2	Rochester Tire Heater Co.....	43	Phillips-Laffitte Co.....	37
Saws, Hack		West Tire Setter Co.....	43		
Millers Falls Co.....	33			Wheels, Wood	
		Tire Setters		Buob & Scheu.....	13
Screw Plates		Bokop, Webb & Palm.....	37	Cray Bros.....	15
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Hart Mfg. Co.....	52	Keokuk Hydraulic Tire Setter Co.....	37	Wheels, Metal	
Wells Bros Co.....	4	Louise Mfg. Co.....	52	Electric Wheel Co.....	17
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Wiley & Russell Mfg. Co.....	35			Wood Working Machinery	
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Badger State Machinery Co.....	38	Indiana Top & Vehicle Co.....	36	Wrenches	
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C. D. Edwards.....	46	Buffalo Forge Co.....	14		
Little Giant Punch & Shear Co.....	51	Champion Blower & Forge Co.....	40		
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**LAFFITTE WELDING PLATES**Weld at a low heat, save $\frac{1}{2}$ in time, fuel and labor. No waste.

SAMPLES FREE

The Phillips-Laffitte Co. Philadelphia, Pa.



This is a 9 in. jointer and a 4 in. rounding head. Made of one solid piece of steel and mounted in a heavy cast frame. It is easily mounted on a simple wood table that any handy man can readily make.

It will joint and plane lumber, round tongues, coupling poles, doubletrees, etc., and chamfer or round circular work as hounds, fellows. It will bore holes in wood and tenon spokes.

Write for prices and circulars. For sale by leading jobbers or direct.

W. L. Sherwood Kirksville, Mo.

ESTABLISHED 1836

BEALS & CO.*Iron, Steel and Hardware*

Tools and Supplies for Horseshoers and General Blacksmiths
Carriage Hardware and Woodwork

44, 46, 48, & 50 Terrace, BUFFALO, N. Y.

SPAVINOFF CURES

Spavin, Ringbone, Grease Heel, Sweeney, Windgall, Enlargements, Curb, Galls, Sores, Polle-vil, Scratches, Shoe Boils, &c. Removes unnatural growths and lameness, leaving flesh smooth and clean. Write for Testimonials.

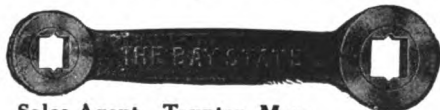
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\$1.00 per Box, by Mail. For Horses and Cattle.

The Bokop Tire Setter and Cooler

Is the Best and Only Machine that has stood the test during the last 29 years on all classes of work, and is the Only Machine built with the Indestructible Wrought Iron Face Plate. Over 2,000 are in successful operation, repairs on which have not exceeded \$6.00 in the last 29 years. For prices, references and descriptive circulars, address,
BOKOP, WEBB & PALM, - Defiance, Ohio

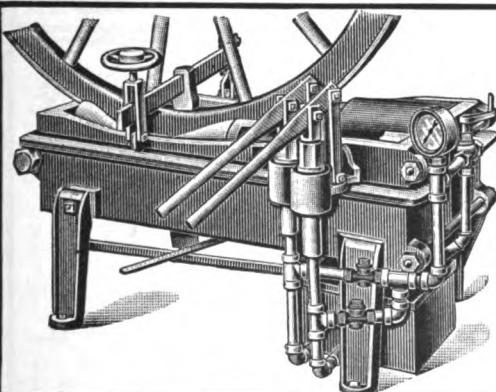
"Bay State" Double End Carriage and Tire Bolt Ratchet Wrenches

They
Save
Time



They
Save
Money

GEO. A. CUTTER Sales Agent Taunton, Mass.

**The Little Giant Hydraulic Tire Setter**

Mr. Blacksmith:

Tire setting will soon commence. Are you equipped? Delay may mean loss to you. Write today for descriptive matter.

Address

Keokuk Hydraulic Tire Setter Co.
KEOKUK, IOWA

**Current Heavy Hardware Prices.**

The following quotations are the lowest prices generally prevailing, August 25, 1913. They are subject to change without notice, and higher prices are charged according to quality specifications and other conditions.

No changes are reported in iron and steel quotations.

Beginning Sept. 1st a new wheel list will be adopted. This list is the one issued by the manufacturers on May 1st and out of store prices are listed under the proper head this month. (See Wheels)

The new No. 7 Weiss & Lesh list on spokes has been adopted and prices will be 50% discount from that list.

Changes in the prices on Rough Sawn Felloes will also be noted in the proper column.

It is reported that jobbers will hereafter make no total invoice charge of less than 15 cents plus postage charges. It is explained that orders are often received for a total amounting to 6 or 8 cents and as such orders are filled at a loss the above rule is necessary.

Trade is reported as very good and collections are much improved.

Horse Shoes—	
All Iron Shoes.....	\$4.30
Steel Shoes.....	4.10
No. 0 and No. 1, 25c. extra. 15c. per keg additional charged for packing more than one size in a keg.	
Mule Shoes.....	4.90
X. L. Steel Shoes.....	5.50
Countersunk Steel Shoes.....	6.00
Tip Shoes.....	5.75
Goodenough, heavy.....	6.00
Goodenough, sharp.....	6.50
Toe Weight.....	7.00
Side Weight.....	9.25
E. E. Light Steel.....	5.50
Steel Driving.....	5.50
O. O. Mule Shoes, extra.....	1.50

Anvils..... .11

Merchant Bar Iron—
\$2.00 rates, full extras, and 20 cents per 100 pounds extra for broken bundles.

Steel Bars—
\$2.00 rates, full extras.

Toe Calks— Per Box
Blunt..... \$1.25
Sharp..... 1.50

Screw Calks—					
Blissard M	\$18.00	\$18.00	\$20.00	\$20.00	\$22.00
Sure Grip M	18.00	18.00	20.00	20.00	22.00
Bl. D'md M	18.00	18.00	20.00	20.00	22.00
Red Tip M	20.00	20.00	22.00	22.00	24.00
Rowe, Jr. M	18.00	18.00	20.00	20.00	22.00
R. Rg. Pt100	2.00	2.20	2.40	2.60	3.20

Plow Lays—	
Solid Cast.....	\$.08 1/4
Crucible.....	.09 1/4
Soft Center.....	.12 1/4

Fitted Plow Lays—	
Crucible, 12".....	\$1.50
Crucible, 18".....	1.90
Soft Center, 12".....	1.90
Soft Center, 18".....	2.45

Quick Repair Lays—	
Crucible, 12".....	\$1.40
Crucible, 18".....	1.70
Soft Center, 12".....	1.80
Soft Center, 18".....	2.25

Hickory Lumber—Per Foot—	
1 to 2 1/4.....	\$.10
2 1/2 to 4 1/4.....	.12

Ash and Oak Lumber—Per Foot—	
1-1 1/4.....	\$.08
1 1/2-2.....	.08 1/2
2 1/4-3.....	.09
3 1/2-4.....	.10

Yellow Poplar Lumber—Per M. Feet—			
6 to 12	13 to 17	18 to 24	
3/4".....	\$75.00	\$75.00	\$85.00
1".....	78.00	78.00	90.00
1 1/4".....	78.00	85.00	95.00
1 1/2".....	85.00	90.00	114.00

Rough Hickory Axles—	Each
3 x 4 x 6 ft.....	\$.75
3 1/2 x 4 1/2 x 6 ft.....	1.00
4 x 5 x 6 ft.....	1.30
5 x 6 x 6 ft.....	2.40
4 x 5 x 6 1/2 ft.....	1.75
4 1/2 x 5 1/2 x 7 ft.....	2.30
5 x 6 x 7 ft.....	2.80
5 x 7 x 7 ft.....	3.40

Finished Hickory Axles—	
For 2 1/2 and 2 3/4 Skeins.....	\$.95
For 3 Skeins.....	1.10
For 3 1/4 Skeins.....	1.35
For 3 1/2 Skeins.....	1.50
For 3 3/4 Skeins.....	1.80
For 4 Skeins.....	2.10

Rough Oak Bolsters—					
3 x 4.....	\$.36	\$.40	\$1.30	\$1.35	\$1.75
4 x 5.....	.60	.70	2.20	2.55	3.00
5 x 6.....	1.00	1.20			

Finished Oak Bolsters—	
2 1/4 x 3 1/4 and under.....	\$.60
3 x 4.....	.65
3 1/4 x 4 1/4.....	.80

Rough Oak Wagon Tongues—	
4 x 4 x 2 x 4 x 12 and smaller.....	\$1.15

Finished Oak Wagon Tongues—	
3 1/4 and smaller.....	\$1.35
3 1/4.....	1.45
4.....	1.55

Two-Inch Sawn Hounds	Per Pair
Tongues.....	\$.35
Front.....	.40
Hind.....	.50

Wheels—	
Sarven Patent—white—not tired.....	50%
Tiring—No. 13 and less.....	45%
Tiring—No. 17 and larger.....	30%
Screws 1 1/4" Thread and less.....	50%
Rivets 1 1/4" Thread and less.....	40%
Screws or Rivets 1 1/4" and heavier.....	40%
Boring or Boxing less than 10 set lots.....	40%
Boring or Boxing 10 sets or more of one size.....	60%
Priming wheels, net.....	25c
Oiling not tired, set.....	20c
Allowance of 25c per set on all special tired wheels with three or four piece rims	
Oiling, not tired, No. 17 to No. 39.....	25c
Oiling No. 45 and larger.....	40c

Special Wheels Tired—					
No.	Tire	Per Set	No.	Tire	Per Set
0	3/4 x 1 1/4"	\$6.80	9	1 1/4 x 1 1/4"	\$8.95
1	1/2 x 1 1/4"	7.05	9	1 1/4 x 1 1/4"	9.40
3	1 x 1 1/4"	7.40	13	1 1/4 x 1 1/4"	11.60
3	1 x 1 1/4"	7.65	13	1 1/4 x 1 1/4"	12.00

Cupped Oak Hubs—Set		Plain End Oak Hubs—Set	
7 x 8 x 9.....	\$1.30	10 x 14.....	\$3.30
7 x 9 x 10.....	1.50	11 x 14.....	4.20
8 x 9 x 10.....	1.55	11 x 15.....	4.50
8 x 10 x 11.....	1.80	11 x 16.....	5.10
9 x 10 x 11.....	1.95	12 x 16.....	5.75
9 x 11 x 12.....	2.00	12 x 17.....	6.30
10 x 12 x 13.....	3.00	13 x 18.....	7.00
11 x 13 x 14.....	4.20		
12 x 14 x 15.....	5.10		

Rough Sawn Felloes—			
1 1/2 x 2".....	\$1.70	2 x 2 1/2".....	\$2.10
1 1/2 x 2 1/4".....	1.90	2 1/4 x 2".....	4.60
1 1/2 x 2 3/4".....	2.00	3 x 3".....	5.50
	3 x 3 1/2".....		\$5.75

Ironed Poles, White, XXX—	
1 1/4 x 2 1/4" No. 2.....	\$3.80
2 x 2 1/2" No. 3.....	3.80

Ironed Shafts, White, XXX—	
1 1/4 x 2" and smaller.....	\$1.95
1 1/2 x 2".....	2.20
1 1/2 x 2 1/4".....	2.70

Farm Wagon Bows—	
Round Top, 1/2 x 2".....	\$.60
Flat Top, 1/2 x 2".....	.75
Round Top, 3/4 x 2 1/4".....	1.35

Standard Size Plane Bodies with Seats—	Each.....
	\$4.25

Plow Beams—	
1 Horse.....	\$.60
2 Horse.....	.75
3 Horse.....	1.10

Spokes and Rims—	
Oak and Hickory Spokes, Net on Weiss & Lesh List No. 6.....	
Finished Rims—XX—1 1/4".....	\$1.50
Finished Rims—XX—1".....	1.65
Oak Rims—Discount.....	40-10%
Hickory Rims.....	40%

Wagon Neckyoke Woods—	
Keller & Tamm's List—Discount.....	25%

Wagon Whiffletree Woods—All Grades	
Keller & Tamm's List—Discount.....	25%

Oval Plow Doubletrees—		Flat Plow Doubletrees—	
2 1/4 x 36".....	\$1.60	1 1/4 x 3 1/2 x 42".....	\$2.75
3 x 40".....	2.40		

Wagon Evener Woods—	
2 x 4 and 2 x 4 1/2—Keller & Tamm's List—Discount.....	30%
Larger.....	25%

Buggy Evener Woods—All Grades	
Keller & Tamm's List—Discount.....	25%

Buggy Whiffletree Woods—	
Mixed Second Growth and Second Growth—Keller & Tamm's List—Discount.....	20%

Buggy Neckyoke Woods—All Grades	
Keller & Tamm's List—Discount.....	20%

CUMMINGS & EMERSON
Blacksmith and Wagon Makers' Supplies,
PEORIA, ILL.



We Manufacture
SHEARS
AND
PUNCHES
Hand or power, for shearing and punching plates, bars and angles. Send for Catalogue Q.
BERTSCH & CO.
Cambridge City, Ind.



SIMONSEN
Hot Trimming Shear
Handiest Tool For Cutting Hot Iron And Plow Steel About The Forge. Ask any jobber or write us for circulars showing this, and our all wrought shears for cold shearing.
SIMONSEN IRON WORKS
Box 671 Sioux Rapids, Ia., U.S.A.

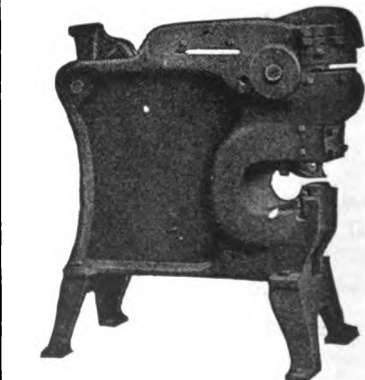
HONEST DEALINGS

Before a display advertisement is accepted for this Journal, inquiry is made concerning the standing of the house signing it. Our readers are our friends and their interests will be protected. As a constant example of our good faith in *The American Blacksmith* advertisers, we will make good to subscribers loss sustained from any who prove to be deliberate swindlers. We must be notified within a month of the transaction giving rise to the complaint. This does not mean that we will concern ourselves with the settlement of petty misunderstandings between subscribers and advertisers, nor will we be responsible for losses of honorable bankrupts, nor can it include advertisements under the head of "Wanted and For Sale."

HAUSAUER-JONES
PRINTING COMPANY

Magazines, Books
—and—
High Grade Catalogs

253 Ellicott St. Buffalo, N.Y.

No. 5 Combined Punch and Shear

Punches 3/4 in. hole through 3/4 in. iron. Shears 5 in. x 1/2 in. flat iron bars. Shears 1 1/4 in. round iron bars. Shears 6 in. x 1/4 in. band iron.

Our Large Descriptive Circular will interest you. So will our price.
BADGER STATE MACHINERY CO.
19-25 Trinity Street Janesville, Wis.



THE OWNERS OF THESE SHOPS ARE MAKING BIG MONEY.

Examine these pictures carefully. Here are two representative shops, well equipped and well managed. Wherever you find a prosperous blacksmithing business, you find a shrewd smith who gives special attention to the selection of the right smithing coal. Good coal is the foundation of all good work. No matter what your skill in handling the metal, poor coal will spoil your best efforts. That's why so many up-to-date progressive shopowners are constant users of WEBSTER SMITHING COAL. It is free from impurities; that we guarantee. It ignites quickly, burns long and steadily and insures a perfect weld.

Our free booklet contains interesting facts for every Shopowner.

Write today for your copy.

Pennsylvania Coal & Coke Corporation, Whitehall Building
NEW YORK

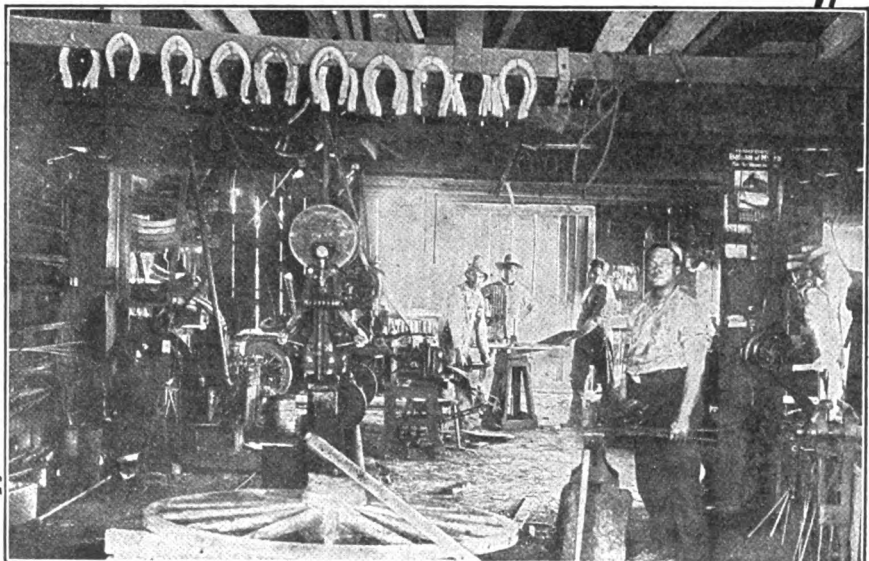
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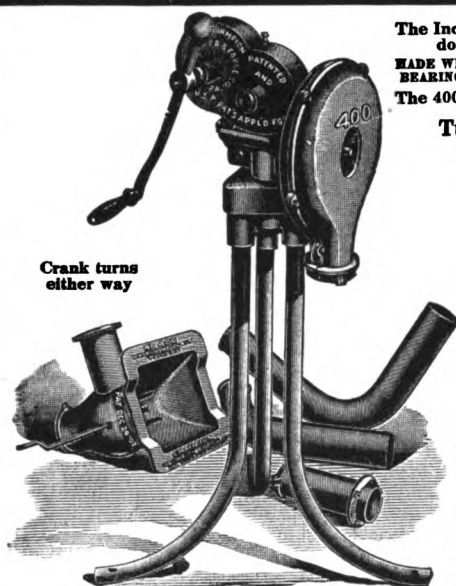
PENNSYLVANIA
COAL & COKE
CORPORATION,
Whitehall Building,
New York, N. Y.

Send me a free copy of your booklet on Smithing Coal and its importance in the Shop.

Name

Address





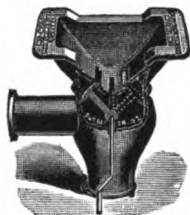
Crank turns either way

No. 400

The Incomparable 400 Blower, the one great Heirloom that will be handed down from one generation to the other. Ask what the owners say.
MADE WITH BALL BEARINGS ONLY. **OVER SIX HUNDRED THOUSAND IN USE**

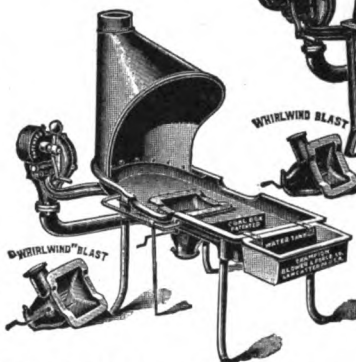
The 400 is the Blower that has Revolutionized the World in making Hand Blast

Tuyere Iron That Makes a Whirlwind Blast



The "Whirlwind" Blast Anti-Clinker, Heavy Nest Tuyere Iron produces a circular, rotary whirlwind blast and concentrates the heat in the tuyere nest, not permitting it to blow up and out of the chimney, therefore makes a hotter fire and heats the iron one third quicker, saving much coal.

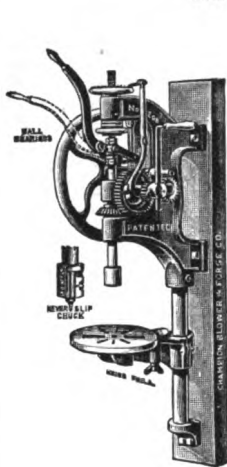
The No. 400 "Whirlwind" Blast, Anti-Clinker, Heavy Nest Tuyere Iron is furnished with all 400 Blowers WITHOUT EXTRA COST.



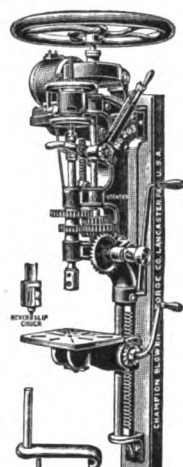
No. 433. Cast Iron Blacksmiths' Forge



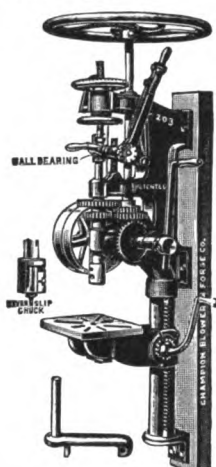
No. 408. Steel Blacksmiths' Forge



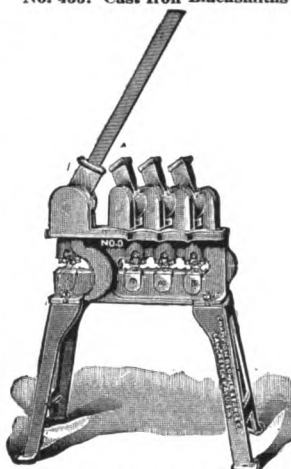
No. 200. Self-Feed and Adjustable Lever Feed Drill.



No. 203. Self-Feed and Double Compound Lever Feed, Electrically-Driven Post Drill.



No. 203. Self-Feed and Double Compound Lever Feed Drill.



THE CHAMPION MULTIPLE PUNCH

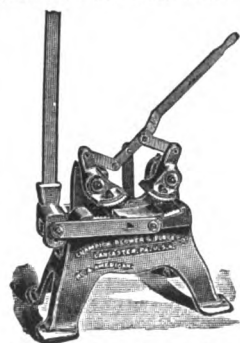
No. 0. Champion Multiple Punch, capacity $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$ and $\frac{3}{4}$ -inch hole in $\frac{3}{8}$ -inch material.



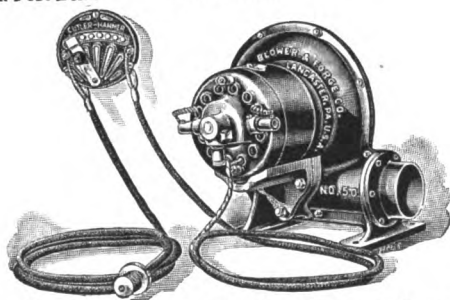
THE CHAMPION "PATENTED" POWER HAMMER

No. 0. Champion Patented Power Hammer with 30-lb. Ram.

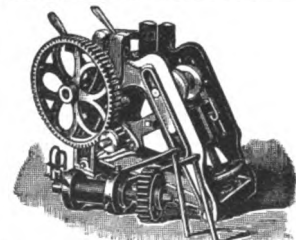
No. 1. Champion Patented Power Hammer with 65-lb. Ram.



No. 4. AMERICAN TIRE AND AXLE SHRINKER
Will shrink up to 4x1 inch round edge tire, and axles up to 1 1-4 in.



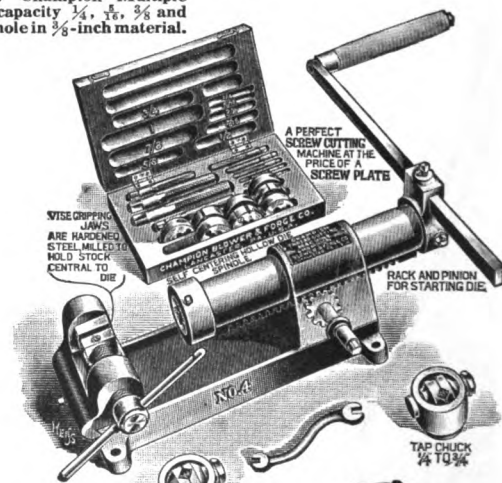
No. 50 Champion One-Fire Variable Speed Electric Blacksmith Blower with a Universal Motor for both Direct and Alternating Current, either 110 or 220 volts, with Detached Rheostat for six speeds, and Steel Pressure Blower Case, for all kinds of general Blacksmith work.



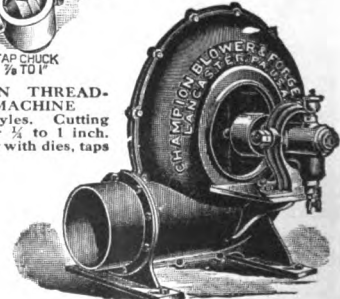
THE CHAMPION "COLUMBIAN" TIRE BENDER
Made in three sizes.



SCREW PLATES IN FOUR STYLES, CUTTING UP TO 1 1-2 IN.
Before purchasing a Hand Blower, Forge, Drill Press, Tire Bender, Tire Shrinker, Screw Plate, Power and Electric Blower, Hammer, Punch, or Shears, write for our free catalogue, which always shows the greatest variety of improved Blacksmith tools built under one control in the world.



THE CHAMPION THREAD-CUTTING MACHINE
Made in four styles. Cutting from $\frac{1}{4}$ to $\frac{3}{4}$, or $\frac{1}{2}$ to 1 inch. With dies only, or with dies, taps and tap chuck.



THE CHAMPION BLOWER AND FORGE CO., Lancaster, Pa., U. S. A.

FAN BLOWERS MADE IN SIZES UP TO 64 INCHES IN HEIGHT

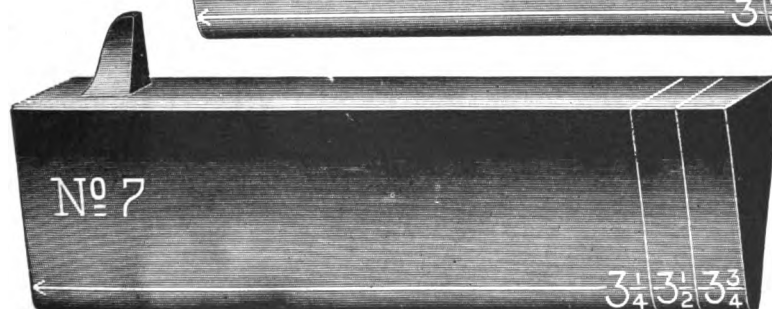
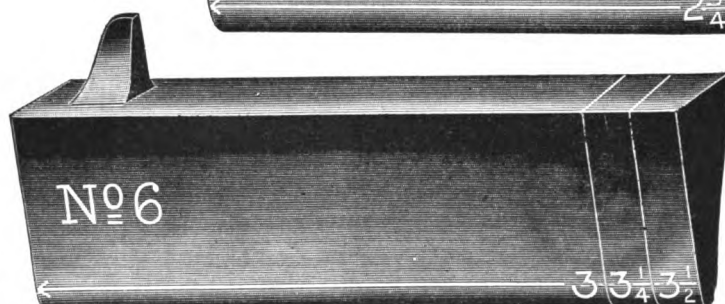
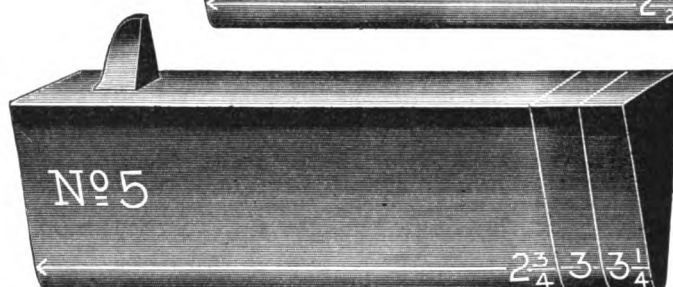
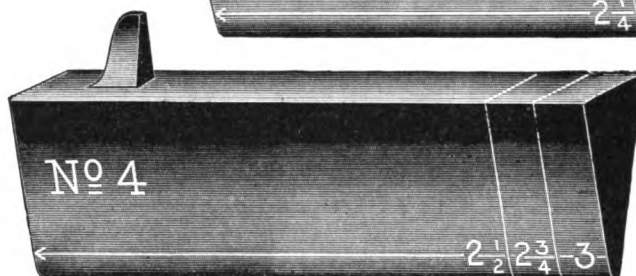
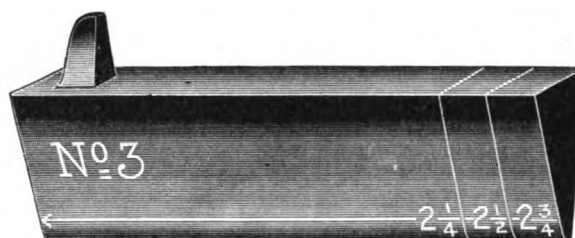
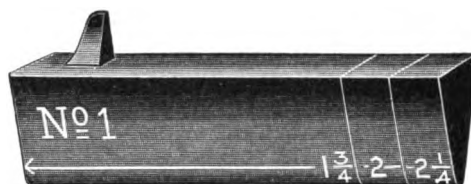
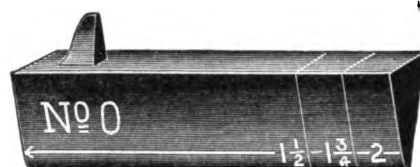


SHARP CALKS

With the Fall and winter season coming on, you will be looking for your sharp calks. The American Toe and Heel Calks not only supply you with the most complete and satisfactory sizes and lengths but are unequaled for welding qualities.

Try them once and we will be willing to take our chances on the future.—

*For Sale
by all
Dealers*



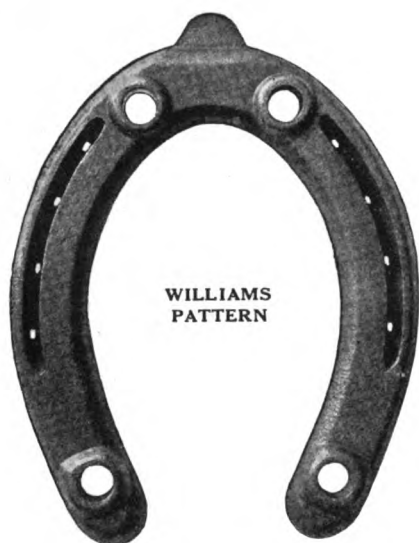
**American
Horse Shoe Co.**

Phillipsburg, New Jersey



UNITED STATES

SHOES ARE ALWAYS AHEAD



WILLIAMS
PATTERN

Be sure to specify
U. S. SHOES
when ordering your
WINTER STOCK
as we have the
Largest Variety
to select from.

SOLD BY
**HORSESHOERS' SUPPLY
HOUSES NEARLY EVERYWHERE**



WRITE FOR ONE OF OUR HANDSOME SOUVENIR WATCH FOBS WHICH
WE ARE SENDING TO ALL HORSESHOERS FREE UPON REQUEST
WHO SEND US THEIR NAME, TOWN, STREET AND NUMBER;

ALSO CATALOGUE ILLUSTRATING OUR COMPLETE LINE

United States Horse Shoe Company
ERIE, PENNSYLVANIA, U. S. A.



SEPTEMBER, 1913



THE AMERICAN BLACKSMITH

43



HORSESHOE CALK TAPS



These taps are used with the various Screw Calks on the market, and are guaranteed to be absolutely correct.

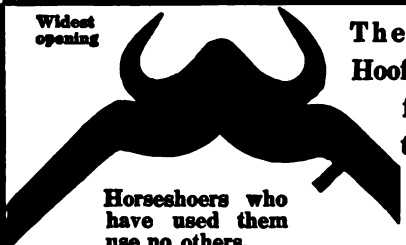
If you have had trouble with other makes of Taps, try ours. Your dealer will supply you, but **insist on Butterfield's.**

BUTTERFIELD & CO.,

Derby Line, Vt., U. S. A.

NEW YORK STORE: 226 CHAMBERS STREET
Write for our new Catalog. free for the asking

Widest opening



Horseshoers who have used them use no others.

For sale by all leading Jobbers

The Wagner & Lowe Hoof Nippers are drop-forged from the best tool steel, hand tempered and hand finished throughout.



The Lowe Manufacturing Co., Enderlin, N. Dak.

THE ROCHESTER

HARD HITTING

HELVE HAMMER

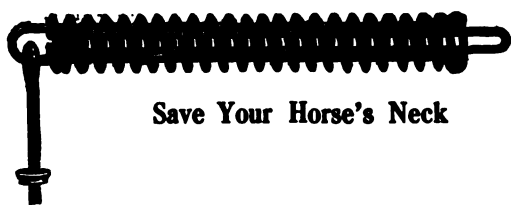


MADE IN SIX SIZES
Dies lengthwise or crosswise as preferred.

Get a Rochester Hard Hitting Helve Hammer in your shop at once. It's the best helper you could have around. It's a worker, it's a money maker. Let us tell you more about it. Write for catalog.

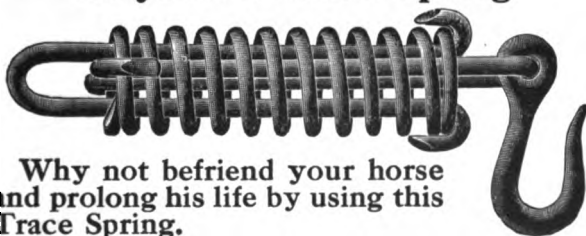
THE WEST TIRE SETTER CO.
ROCHESTER NEW YORK

RAYMOND POLE SPRINGS



Save Your Horse's Neck

Keystone Trace Spring



Why not befriend your horse and prolong his life by using this Trace Spring.

Keystone Brake Springs



Write your Jobber for Circular and Prices

RAYMOND MANUFACTURING CO.

CORRY - LIMITED - PA.

Don't Wait Until It Is Too Late

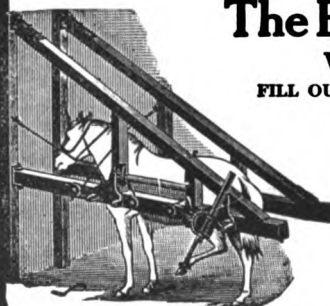
INSTALL A

BARCUS HORSE STOCK

now and do away with the danger of broken bones or possibly a fatal kick. A machine perfect in every detail, easily and quickly operated, strong and simple, which gives absolute control over the most vicious animal. They insure safety to both man and beast and are guaranteed to give satisfaction or money refunded.

The Barcus Mfg. Co.
WABASH, IND.

FILL OUT AND MAIL COUPON AT ONCE

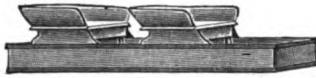


Please send me full particulars regarding your Horse Stocks without any obligation on my part.

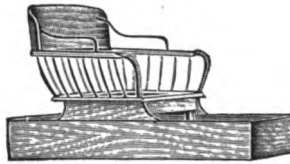
Name

Town

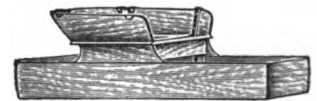
State

**No. 244 BODY AND SEATS**

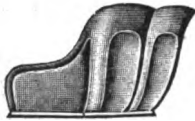
Price, no Seats\$5.75 and up
Price, with Seats 6.75 and up

**STICK SEAT BODY**

\$3.85 and up

**PIANO BODY**

With Seat\$1.60 and up
Without Seat95 and up

**AUTO SEAT**

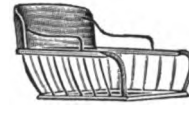
Untrimmed...\$2.65 and up
Trimmed 7.85 and up

**BENT PANEL SEAT**

Untrimmed...\$2.90 and up
Trimmed 5.90 and up

**PANEL SEAT**

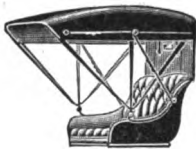
Untrimmed...\$.65 and up
Trimmed 3.85 and up

**STICK SEAT**

Untrimmed...\$2.75 and up
Trimmed 6.05 and up

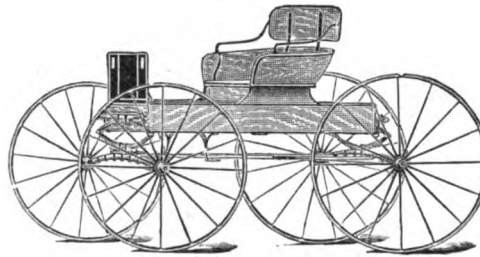
**STICK AUTO SEAT**

Untrimmed...\$1.65 and up
Trimmed 5.65 and up

**AUTO SEATS—TOP SETS**

Seat\$3.25 and up
Cushion and Back 3.85 and up
Top 7.95 and up

\$15.05



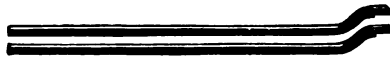
\$17.30 to \$27.10

**TOP SETS**

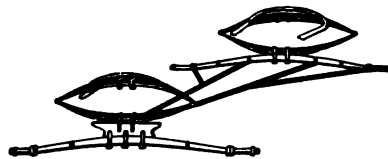
Seat\$1.15 and up
Cushion 1.55 and up
Back 1.75 and up
Top 5.65 and up

\$10.20

Double Trees With Single Trees Attached
Buggy and Surrey Size each 60c.

**BENT REACHES**

Assorted Sizes 6 for 60c.

**BUGGY GEARS**

Each\$5.95

**POLES**

In the White\$3.60
Painted 4.35

STRAIGHT REACHES
Assorted Sizes 10 for 60c.



AXLE BEDS
Assorted Sizes, Drop 14 for 60c
Assorted Sizes, Arch 10 for 60c

Buggy and Surrey Cross Bars
Assorted Lengths 10 for 60c

SPRING BARS
Assorted Sizes 14 for 60c.

Buggy and Surrey Single Trees
Assorted 10 for 60c.

BUGGY SPOKES
Per 100

1 1/4 in. Sar. Pat.\$2.95
1 in. Sar. Pat. 2.25
1 1/4 in. Sar. Pat. 2.65
1 1/4 in. W. H. 1.30
1 1/4 in. Sar. Pat. 3.50

**Wood Hub Spokes**

Per Set
2 1/4 in. 2.00
2 1/2 in. 2.05
2 3/4 in. 2.15
2 1/2 in. 2.25

**SHAFTS**

Buggy Size, Per Bundle\$4.95
Surrey Size, Per Bundle 5.50

**SHAFTS**

Buggy Size (White), \$1.65
Buggy Size (Painted) 2.40

**BAILEY BODY LOOPS**

65 cts. and up.

**Elliptic Springs**

75 cents and up

HOW CAN WE DO IT? WRITE TO. DAY AND LEARN HOW.

Adjust your wants to the sizes and styles we furnish at the above prices

AND SAVE MONEY.

Our catalogue gives full description of sizes we furnish at the above prices, also Special Freight Offer. We Give 3% off for Cash

A. Wheel, Top & Hdwe. Co.
502 Freeman Ave., Cincinnati, O.

**LIGHT WHEELS**

With Steel Tire on. \$ 4.95 and up
With Rubber Tire on. 12.40 and up
We make all sizes.

**FIFTH WHEEL**

Assorted Sizes
2 for 65c.

**RIMS**

We carry all sizes
Plain Rims\$.95 and up
Beveled Rims 1.40 and up
5 piece Bored and Rounded Rims, assorted sizes, for 60c.

**BODY LOOPS**

3 set (12 pieces) for 65c.

**DASHES**

20-in. Drill 20c.
19-in. Leather 45c.
22-in. Leather 85c.
24-in. Leather 95c.
26-in. Leather 55c.

HEAD BLOCKS
Assorted Sizes
8 for 60c.

**Wheel Head Rivets**

Assorted Sizes
15 lbs. for 65c.



Blacksmiths, Garage Men and Manufacturers

DON'T LET AN



STOP YOU

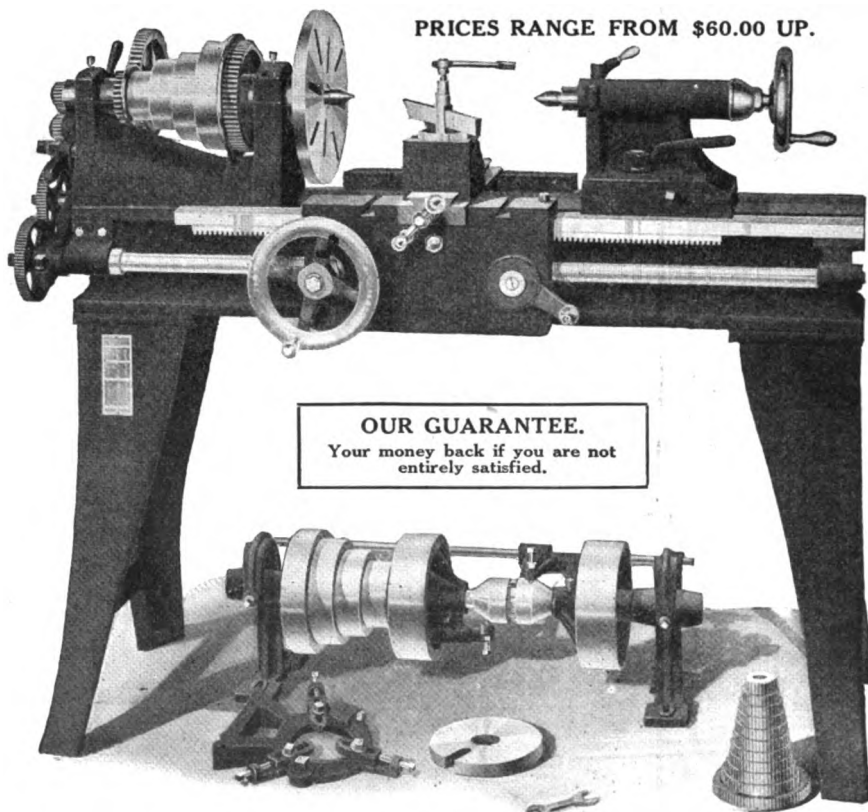
We know that "IF" you could see our lathes you would not hesitate in ordering from us, for they are practical in design, unexcelled in workmanship and, size for size, considerably heavier than other makes that will compare with ours in general design.

WHY HESITATE ANYWAY? Every lathe we sell is sent out with our guarantee: Your money back, including all freight charges, if you are not thoroughly satisfied. If the lathe is not what we claim it is, we want you to send it back. Every lathe we sell adds one more satisfied customer to our list. **MACHINERY CATALOG No. 60A16 FREE ON REQUEST.**

PRICES RANGE FROM \$60.00 UP.

**WRITE FOR
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CATALOG
No. 60A16**
It Tells You
About the Best
Machinery
at the Lowest
Possible Prices.
It Is Mailed
FREE
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We Do Not
Make
Shipments
Outside the
Limits of
the
United States.



OUR GUARANTEE.
Your money back if you are not
entirely satisfied.

**HAVE YOU
A LATHE
IN
YOUR
SHOP?**
If Not,
**BUY ONE
NOW**
and Be Ready
for the Man
With
the Lathe Job

We Do Not
Make
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Limits of
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United States.

Address **SEARS, ROEBUCK AND CO., Chicago, Ill.**



Triumph Light

Everybody Wants Better Light
Here It Is
THE NEW TRIUMPH

System, Stand and Portable hanging lamps - anybody can use or sell them and make good money - why can't you?

A new 150 to 700 candle power. Shadowless light - ready at a finger's touch - that can be turned up and down like gas and left burning at a mere glimmer and instantly turned up when more light is needed. They meet all requirements of Home, Store, Church or business lighting, in or outdoors, at less than half the cost of gas, kerosene or electricity; anyone can install and operate.

Write for AB catalog, it tells all about them.

BRILLIANT GAS LAMP CO.,
Dept. 12, No. 182 N. State St., Chicago, Ill.



STEEL STAMPS

Steel Letters and Figures
BURNING BRANDS
Stencil Dies, Stencils, Etc.

GEO. M. NESS, JR.

61 Fulton St., New York

Price List sent upon application



**Buggy and Carriage Tops,
Cushions and Backs,
Wheels, Poles, Shafts,
Finished Shafts, Spokes,
Rims, Rubber Tires.**

Write for Money-Saving Catalog and Price List.
Fischer & Metzger, 111-115 W. Court St., Cincinnati, O.

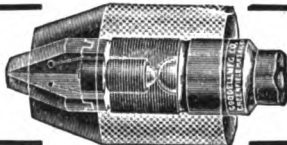
HARVEY BOLSTER SPRINGS

Also Carriage and Auto Springs
Sold by leading jobbers or write us,
Harvey Spring Co., Box 31, Racine, Wis.



Greenfield Drill Chuck

Strong, accurate, well made, and sell at a popular price. Try them without delay.



Especially suitable for the blacksmith. We will send you descriptive circulars upon request.

Ask your Jobber or write us direct.

Goodell Mfg. Co., Greenfield, Mass.

Edwards Shears

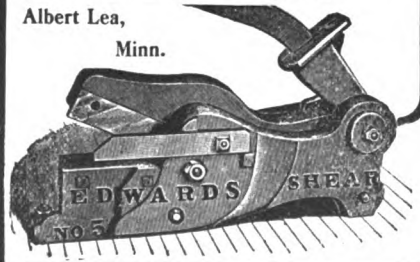
For twenty years the Two Leading Low Priced Shears in the U. S., representing the Greatest Value for the Least Money.

No. 5, weighs 200 lbs., cuts 4 x 1/2 inch soft steel
No. 10, weighs 430 lbs., cuts 4 x 3/4 inch soft steel

At their price you should have had one long ago. Order One from the first iron man that calls on you. They All Sell Them.

Write for descriptive circular and prices.

C. D. EDWARDS,
Albert Lea,
Minn.



"Tools That Wear"

HELLERS' CELEBRATED AMERICAN HORSE RASPS FILES AND FARRIER'S TOOLS

will save you Time and Money. Their Superior Quality sets a known and tested Standard of Excellence. All made from our own Production of Special Refined Clay Crucible Steel and tempered by a Secret Process. New Catalogue Mailed Free on Application.

"H. P. DRIVING HAMMER."

HELLER BROTHERS CO., Newark, N. J., U. S. A.

This Engine Runs on Coal Oil

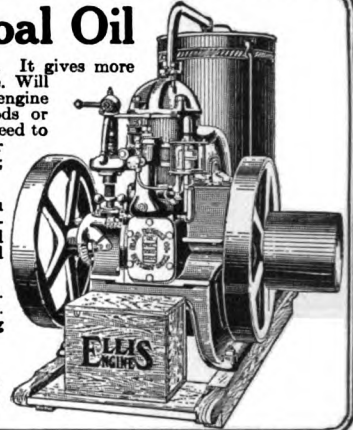
Every blacksmith can afford an Ellis Kerosene Engine. It gives more power on common lamp oil than other engines will on gasoline. Will more than cut your fuel bills in two. Strongest and simplest engine made; only three working parts; no cams, gears, push-rods or springs to wear out or cause trouble. Just the engine you need to run your blower, drill press, lathe, emery, grindstone and other shop machinery. Cheaper than steam or electric power; needs no vacation.

Every engine equipped with patent throttle, giving you *Three Engines in One*; force-feed oiler; speed changing governor; double duty cooling system; automobile muffler; and other exclusive features. Runs either way and can be reversed while running.

Sent to any blacksmith in America on *30 days' approval*. A genuine Free Trial without a penny of expense to you. Binding *10-Year Guarantee* with every engine. Write for big new catalog and opinions of satisfied customers.

Also 2-cylinder engines for heavier work.

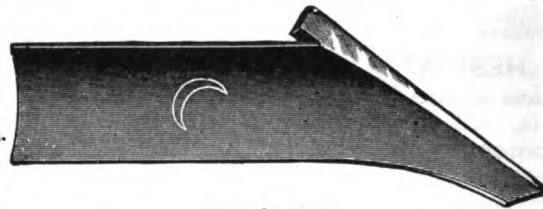
Ellis Engine Co. 97 Mullett St. Detroit, Mich.



EVER-READY BLANK SHARE

THE BLACKSMITH'S FAVORITE

Can be fitted to more styles of plows than can any other pattern.



To save labor use our Fitted Shares for all makes of plows.

Write for Catalog

CRESCENT FORGE & SHOVEL COMPANY

MANUFACTURERS OF HIGH GRADE
FLOWSHARES AND BLACKSMITHS' BLANKS

HAVANA, ILL., U. S. A.



A PERFECT WELDING FLUX
PREPARED ESPECIALLY FOR WELDING
FAR SUPERIOR TO COMMON BORAX

Try Borax-ette for Welding Toe-Calks

THEY WON'T KNOCK OFF

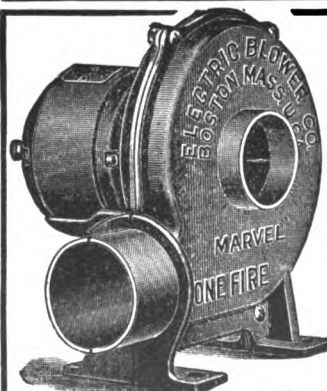
It makes steel weld like iron. It has no equal for welding tires, axles and springs

FOR SALE BY ALL DEALERS

SAMPLES FREE

CORTLAND WELDING COMPOUND CO.,

Cortland, N. Y.



MARVEL

"One Fire" Variable Speed
Electric Forge Blowers

\$28.00 Net

with 15-foot lamp cord

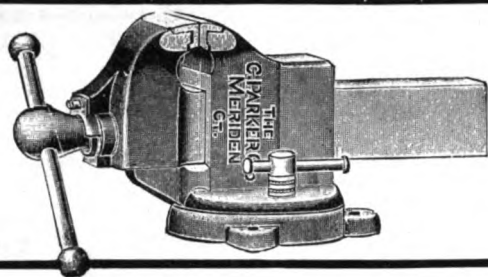
Are the ONLY make that have
OIL RING BEARING Motors

10 other sizes

30 days' trial

ASK YOUR DEALER

ELECTRIC BLOWER CO., Boston, Mass.



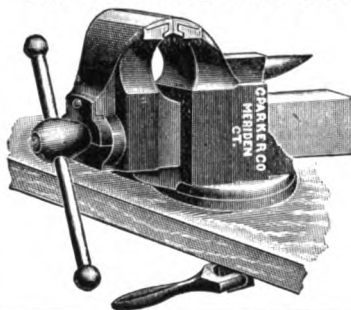
THE PARKER VISES

Always Ready for Use. Excel in Strength, Durability, Finish.

38 Styles, For All Purposes and In Size To Suit.

Parker Vises will be found in the best equipped shops in the country. No other vise has given to the trade such general satisfaction. Our new line of improved vises has reinforced sliding jaws, making the Parker Vises stronger and more durable than ever.

Made of a blending of steel and best iron in the castings.



Our latest catalog mailed free on application.

**The
Chas. Parker
Company
MERIDEN, CONN.**

**A Small Cash Payment and
this "Boss Power Hammer" will
be delivered to you.**

Every up-to-date shop needs a POWER HAMMER because it enables the blacksmith to handle a wide range of work easily, quickly and profitably.

INSTALL A BOSS POWER HAMMER

Right design, simplicity, strength and accuracy are FEATURES that place this hammer in a class by itself. Thousands now in use in large and small shops and always give complete satisfaction.

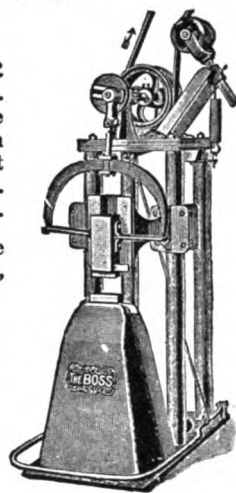
EASY PAYMENT PLAN

You can install a BOSS HAMMER in your shop for a small cash payment. The balance to be paid in reasonable instalments. The hammer will soon pay you big profits on your investment by producing more and better work. Write for full particulars and circulars.

We also manufacture Helve Type for light and rapid forging,—punches, shears and benders.

Armstrong Mfg. Co.

1111 Chestnut Street
WATERLOO, IA.



**SEND
TODAY**

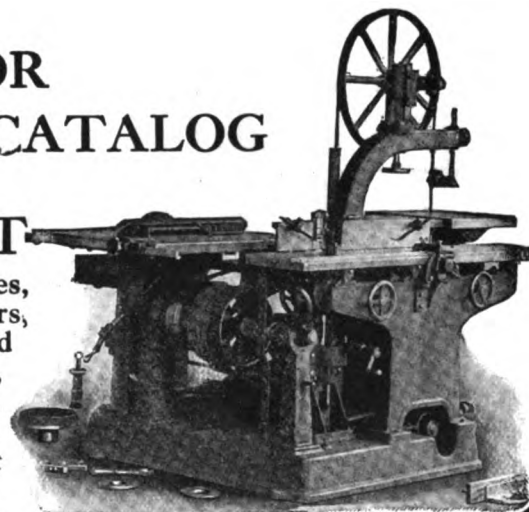
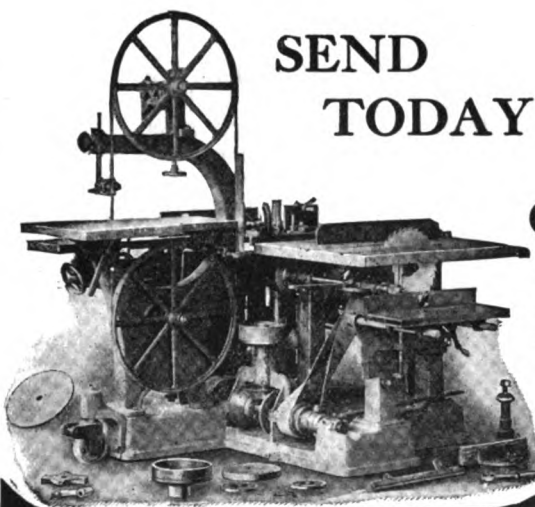


**FOR
CATALOG**

OF

CRESCENT

Jointers, Saw Tables,
Band Saws, Planers,
Shapers, Planers and
Matchers, Disk Grinders,
Variety Wood Workers,
Borers and Crescent
Universal Wood Worker



CRESCENT UNIVERSAL WOODWORKER

THE machine that combines all the wood working equipment most carriage and wagon shops need. It includes band saw, jointer, saw table, borer, reversible single spindle shaper. You have your choice of 26" or 32" band saw, 8", 12" or 16" jointer. If you have a band saw, you can buy the machine without this tool.

Be sure you investigate the CRESCENT line before you buy wood working machinery.

The Crescent Machine Co. 245 Main Street,
LEETONIA, OHIO



Toe-clip
bent up.



Announcement

ALTHOUGH our horse shoe has long been recognized as the best on the market, still we have always been endeavoring to improve it. After several years of experimenting we have at last designed and manufactured a toe-clip (patent applied for) which is by far the best and most improved toe-clip which has ever been successfully tried out and put on the market. This toe-clip is reinforced on both edges, and is the strongest one that has ever been put out on a horse shoe by a horse shoe manufacturer. Besides strengthening the clip the side reinforcements prevent the steel from cracking at the corners. This toe-clip requires no further work than just heating and bending up. The clip is manufactured out flat with the shoe, so that when bent up it sets a great deal further forward on the shoe than the toe-clips which are manufactured already bent up.

Giant Grip Horseshoes are Drop Forged and are made of dead, soft, open hearth steel (to our special analysis). Our horseshoe steel is the toughest steel made and insures the shoe from breakage of any kind. It is also the best shaped horseshoe on the market; hence the easiest to fit.

*Booklet of Styles, Sizes and Prices
Sent on Request*

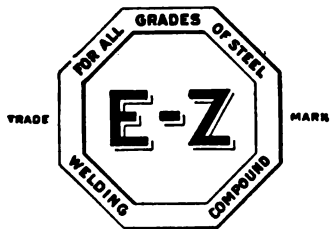
The
Giant Grip Horse Shoe Co.
Oshkosh, Wisconsin

*Manufacturers of the
Original Drive Calk*





"E-Z" Welding Compound



is the best BECAUSE it works equally good on all kinds of steel. It welds at **lower heat** than any other. It sticks to metal at a very low heat. It leaves no

scale. Use it once and you will always want it.

Crescent Welding Compound



makes smoother welds than any other. It is fine for plowwork or where parts are fastened together before

welding, or for making split welds, finishing heats, or for welding under dies, etc., etc. It insures smooth finish and perfect welds on Toe Calks.

"Money back" from any jobber if "E-Z" or Crescent does not give perfect results.

We will send Samples free

Made only by

Anti-Borax Compound Co.

FORT WAYNE, IND.

Reece Combination Screw Plate No. 103

\$8.25 NET WILL BUY ONE



The No. 103 Reece Combination Screw Plate

includes one Reece Adjustable Guide Stock, 24 inches long for 2 7-32 inch diameter DIES; Three individual Full Mounted Stocks; Seven Plate Taps and Seven Reece Adjustable Dies, cutting 1-4 — 20, 5-16 — 18, 3-8 — 16, 7-16 — 14, 1-2 — 12, 5-8 — 11, 3-4 — 10. REMEMBER that this is practically a FULL MOUNTED SET. REMEMBER that the Stocks have MOTTLED FINISH; that the DIES are adjustable, and make perfect threads at one cut; that four persons can use dies from this set at the same time because there are FOUR STOCKS. And LAST, but not LEAST, REMEMBER THE PRICE is only \$8.25 NET, and the Screw Plate guaranteed to give satisfaction or your money will be refunded.

**Can You Afford To Neglect
This Great Opportunity?**

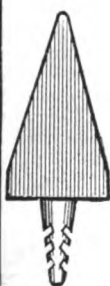
We request you to place your order with your dealer. If for any reason he cannot fill the order (and he can if he wants to), THEN send to us. DO NOT ACCEPT SUBSTITUTES—INSIST on having the REECE COMBINATION SCREW PLATE No. 103.

F. E. WELLS & SON CO., Greenfield, Mass., U. S. A.

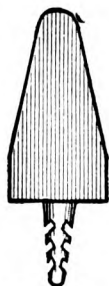
Banner Toe Calks

LATEST and BEST

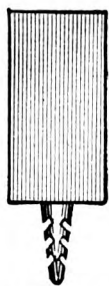
Can not jump out or fall off in the fire because the hot shoe grips the corrugations. No more shoes broken at the first nail hole. The nib is swaged cold from the bar, and every nib is perfect; made from special steel that is easy to weld. Cost no more than ordinary calks. Give a trial order through your jobber and be convinced. Put up in 25-lb. boxes.



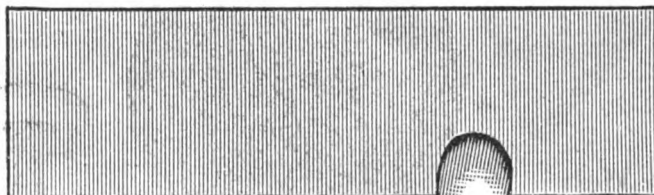
SHARP



COUNTRY



BLUNT

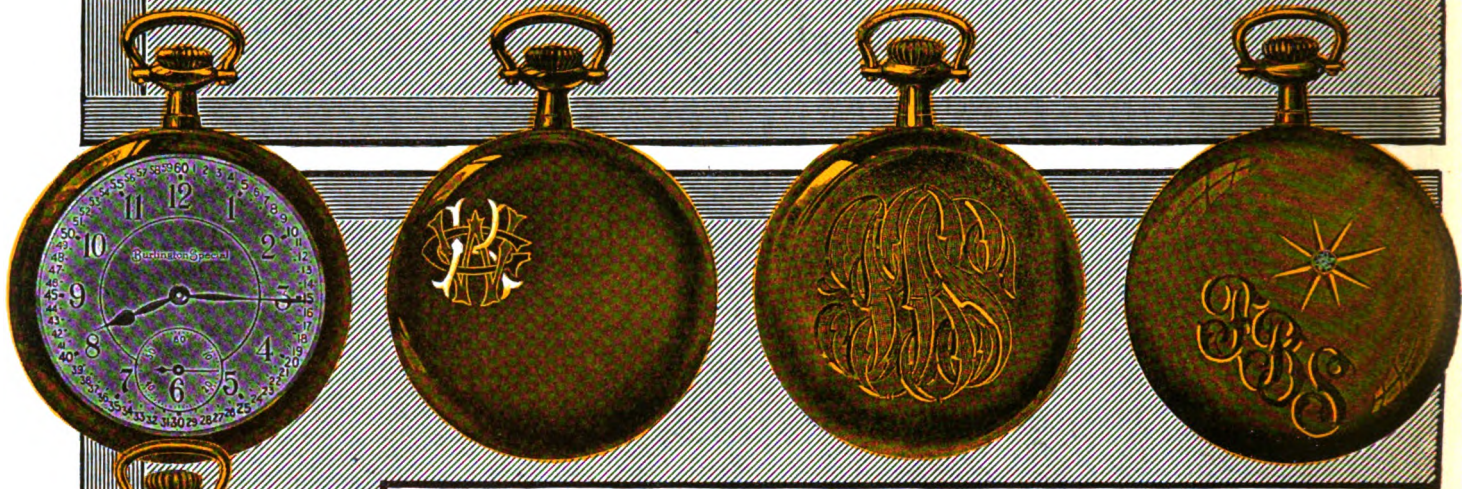


*Kent's Pat.
12-11-'11.*

See the CORRUGATED NIB



BRYDEN HORSE SHOE COMPANY CATASAUQUA PA.



Just Out! Superb New Ideas In Watch Cases!

The latest products of the craft. Exquisitely beautiful. Your own initials handsomely engraved on the superb gold strata case—guaranteed for 25 years. Your choice of **Inlay Enamel Monograms, Block and Ribbon Monograms, Diamond Set, Lodge, French Art, Dragon Designs.** Open face or hunting cases, ladies' or gentlemen's 12 and 16 sizes. A watch to suit every taste. And—DIRECT—at the rock-bottom price.

The masterpiece of watch manufacture—19 jewels—adjusted to the second—adjusted to positions—adjusted to temperatures—adjusted to isochronism.

These Exquisite New Designs

in Watch Cases are winning favor everywhere. And wherever the great Burlington Special has been introduced it is noted for its wonderful time keeping qualities. Ask any railroad man what he thinks of the Burlington Special. Ranchmen, engineers and men in all walks of life whose duties require them to put a watch to the hardest tests prefer the Burlington because they know they can depend upon it.

In the U. S. Navy

Every fighting vessel has the Burlington Watch aboard. The S. S. Connecticut alone has over 200 Burlingtons aboard; the Battleship Georgia has 159 Burlingtons; the new dreadnought Wyoming already has over 100 watches. Many other battleships, such as the New Hampshire, North Carolina, Minnesota, have over 100 Burlingtons aboard.

Think of the constant vibration, the extreme heat in the boiler rooms, the salt air and the change of climate from the Arctic to the Tropical; if a watch will stand up and give accurate service aboard a man-of-war it will stand up everywhere.

Special

A Remarkable Special Offer

For reasons explained in our letter to you (special trade reasons) you can now get *direct* the Superb Burlington Watch at the rock-bottom price—the same price that **even the wholesale jeweler must pay**—and in order to encourage everybody to secure this watch at once, purchasers may pay this rock-bottom price *direct* from us either for cash or \$2.50 a month on this great special offer! We send the watch on approval, *prepaid*.

Sent—No Money Down—Prepaid. Remember, the highest grade watch *direct* (for special reasons, now) at the same price that even the wholesale jeweler must pay! You risk absolutely nothing—you pay nothing—not one cent—unless you want this *exceptional* offer after seeing and thoroughly inspecting the watch.

Send Coupon for Our New Book on Watches

Learn the inside facts about watch prices, and the many superior points of the Burlington over double-priced products. Also illustrations of all the newest up-to-date ideas in exquisite watches, and our letter to you sending the rock-bottom price *direct*. Just send the coupon, or a letter, or a postal.

Burlington Watch Company

Dept. 2736 19th St. and Marshall Blvd., Chicago

Watch

Book Coupon

Burlington Watch Co.

Dept. 2736

19th St. & Marshall Blvd., Chicago

Please send me (without obligations, prepaid), your free book on watches and copy of your \$1,000 challenge, with full explanation of your cash, or \$2.50 a month offer on the Burlington Watch.

Name _____

Address _____





See what the Little Giant

TRADE MARK REG.

PUNCH & SHEAR did for Mr. Williams who has spent 18 years around the Forge Fire.

Hackett, Ark., 3-23-12

KIND SIR:

Your correspondence of the 21st inst. received, and I thank you for calling my attention to same.

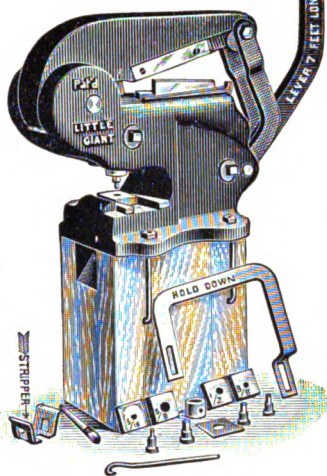
I purchased a No. 2 "Little Giant" Punch and Shear about four months ago, and wish to say it is the best tool ever put in a shop. It is a Time, Trouble, Money and Labor Saver, and I consider the machine paid for its cost the first sixty days.

Truly yours,

(Signed)

FRANK M. WILLIAMS

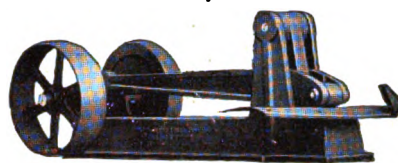
*It will do the same
for you*



Sold by all Leading Jobbers
WRITE FOR CATALOGUE

Little Giant Punch & Shear Co.
210 So. Market St. SPARTA, ILLINOIS

Oh, Look Here, What's This?



Why, it's the Justrite Plow Blade and Disc Sharpener, that every blacksmith ought to have. Does more and better work than power trip hammers, leaving the plow-lay rolled to a sharp, smooth edge and free from nicks. It's the best yet. Ask your jobber, or write us direct.

What a user has to say:

Fairmount, N. D., Aug. 20th, 1911.

Gentlemen:—I have found the Justrite machine just what they claim it to be, and I wouldn't be without one. I had a trip hammer, but I sold it the first chance I had as soon as I owned this machine. I think the Justrite is O. K.

(Sgd.) G. A. WELGE.

Address,

Strite Governor Pulley Co., 304 So. 3rd St., Minneapolis, Minn.

Ask your dealer or write for prices for
"Arm and Hammer" Brand
Wrought Iron Anvils.



FULLY GUARANTEED

The Columbus Anvil & Forging Co.
COLUMBUS, OHIO

The L. S. P. Calking Machine

THE MACHINE THAT CALKS A SHOE COMPLETE. Don't calk your shoes by hand. It is a big waste of time and money, calking shoes by hand. The work of the L. S. P. Calking Machine is much more satisfactory to yourself and customers.

The machine is used every day in the year, on either sharp or blunt work. Used on every shoe you calk. And you are wasting money every day until you have one, whether you are alone or have five men working for you.

The machine that is in use by the U. S. Government.

The machine that is in use in the best shops.

The machine that pleases Bosses, Journeymen, and Customers.

The machine that the users claim more for than the Manufacturer.

The machine you will eventually use.

The machine that was on exhibition at the Master Horseshoers' National Convention at Denver.

WHAT THE MACHINE WILL DO

With one pull of the lever it will completely make either a sharp or blunt heel calk of any desired length, on any size shoe, with the stock where it is needed, and no galls or cold shuts, producing a perfect calk. One pull of the lever welds either a sharp or blunt toe calk, and forms clip or not, as you may desire. No weld like the pressure weld, no losing of toe calks.

It has a shear to cut off the end of shoe for shoeing flat or with pads. It works finely on old shoes and resharping. It makes the Single or Double Block Heel, or the "Phila. Kink," without the use of hammer or change of dies. And in Changing Dies you have no bolts or screws to bother with; all dies pick right out with the fingers.

The machine is made of the very best material and by the best mechanics, and is fully warranted and guaranteed. Write today for testimonials and prices.

"THE EXTREME OF HAND LABOR IS THE EXTREME OF EXTRAVAGANCE"

THE L. S. P. CALKING MACHINE CO.
Wyalusing, Pa., U. S. A.

NATIONAL MACHINE COMPANY
Brighton, Ont., Canada



**SHARP
DIES**

are what are needed in order to cut good threads, and you can always have them if you use a

**"DUPLEX" DIE STOCK SET**

The dies in these sets are easier to sharpen than a knife; this fact enables you to get the full wear out of them. *Write us.*

THE HART MANUFACTURING CO.,

50 Wood Street, :: :: Cleveland, O., U. S. A.

Have You Power in Your Shop?

If so, you want the best Power Transmission Machinery. The Jones line will give satisfaction. It includes machine moulded pulleys, shafting, hangers, boxes, gears, friction clutches, sprocket wheels, chain belt, leather and rubber belt, engineers', mill and factory supplies.

No Order Too Small; as the same careful, prompt attention is given to small orders as to large ones.

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A copy will be sent without charge to anyone interested. Write today.

W. A. Jones Foundry & Machine Co.

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Use **Suregrip**
Calks

There is no other calk as good as the Suregrip.

Demand them from your jobber.

AMERICAN CALK COMPANY

DETROIT, MICH.

"First Made in America."

Hay-Budden Solid Forged Anvils

HAY-BUDDEN MFG. CO., Brooklyn, N. Y.



200,000 in Use.

Entire top being in one piece of high-grade forged steel, makes a loose face impossible.

"The Capewell" Brand

of horse nail is especially distinctive in quality and appearance.



"Capewell" nails have a world-wide reputation. They drive easier and hold better than any other nail.



The **check mark** on the face of the head makes it easy to identify this brand. No other nail is so marked.

The Capewell Horse Nail Company
HARTFORD, CONN.

Largest Makers of Horse Nails in the World

OVER 1,500 BLACKSMITHS
will tell you that we send out
THE BEST TIRE
SETTERS MADE

and, if you don't believe them, we will send you one on trial in competition with any other make and let YOU be the judge.

Our machines set tires to the true circle of the wheel without kinking and do it easier and quicker than any others.



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TRADE **PIONEER** C.S.&CO. MARK
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Fill the Bill

**Every
Time**

When you
order Shaft
Ends say

"Pioneer"
first

HIS MASTER'S CHOICE

CRANDAL, STONE & COMPANY

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